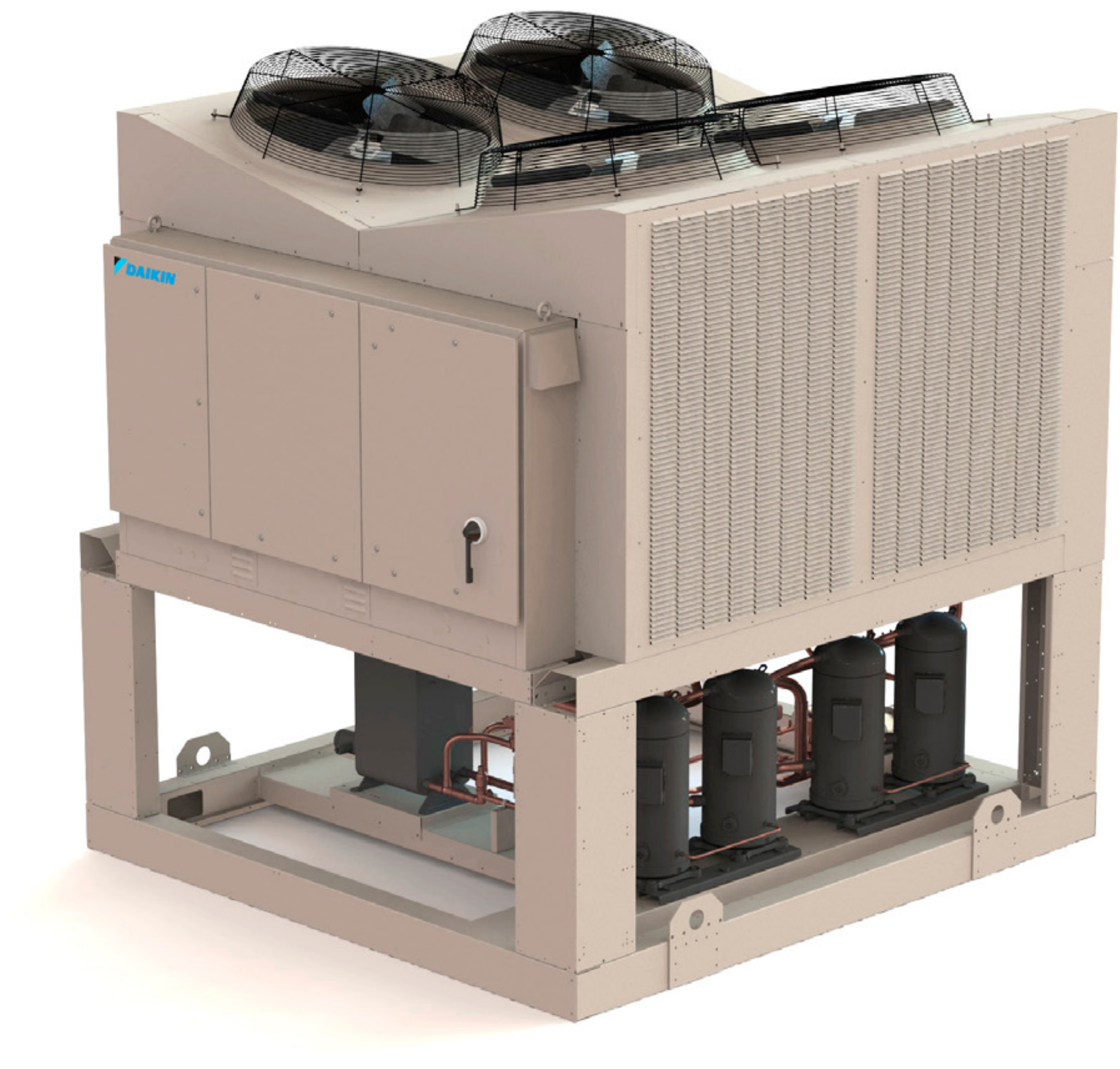
Installation, Operation, and Maintenance Manual	IOM 1206-1
	Group: **Chillers**
	Part Number: **IOM1206-1**
	Date: **May, 2014**

Air-Cooled Scroll Compressor Chiller

AGZ030EH - AGZ070EH, Packaged Chillers
R-410A, 50/60 Hz



Contents

Hazard Identification

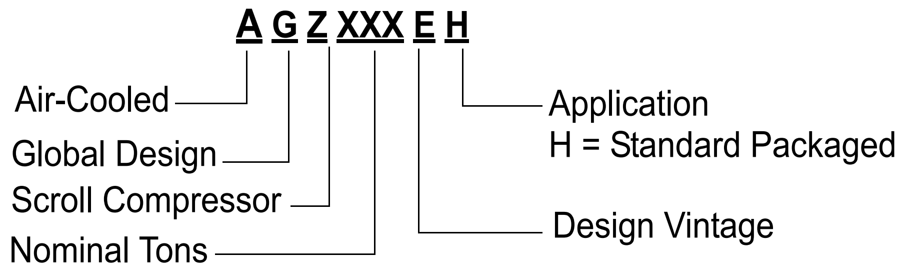
⚠ DANGER
Dangers indicate a hazardous situation which will result in death or serious injury if not avoided.

⚠ WARNING
Warnings indicate potentially hazardous situations which can result in property damage, severe personal injury, or death if not avoided.

⚠ CAUTION
Cautions indicate potentially hazardous situations which can result in personal injury or equipment damage if not avoided.

Modbus

Chiller Nomenclature



⚠ WARNING

Installation is to be performed by qualified personnel who are familiar with local codes and regulations.

⚠ CAUTION

Sharp edges on unit and coil surfaces are a potential hazard to personal safety. Avoid contact with them.

General Description

Daikin air-cooled water chillers are complete, self-contained, automatic chiller units designed for outdoor installation. Packaged units are completely assembled, factory wired, charged, and tested.

The electrical control center includes all equipment protection and operating controls necessary for dependable automatic operation.

Additional Manual

This manual covers the installation, of dual circuit, AGZ-EH packaged, scroll compressor chillers using R-410A.

Information for units with either the pump package or remote evaporator options can be found at www.DaikinApplied.com.

Inspection

Check all items carefully against the bill of lading. Inspect all units for damage upon arrival. Report shipping damage and file a claim with the carrier. Check the unit nameplate before unloading, making certain it agrees with the power supply available. Daikin Applied is not responsible for physical damage after the unit leaves the factory.

Handling

Be careful to avoid rough handling of the unit. Do not push or pull the unit from anything other than the base. Block the pushing vehicle away from the unit to prevent damage to the sheet metal cabinet and end frame (see Figure 1).

To lift the unit, 2-1/2" (64mm) diameter lifting eyes are provided on the base of the unit. Arrange spreader bars and cables to prevent damage to the condenser coils or cabinet (see Figure 2).

Figure 1: Suggested Pushing Arrangment

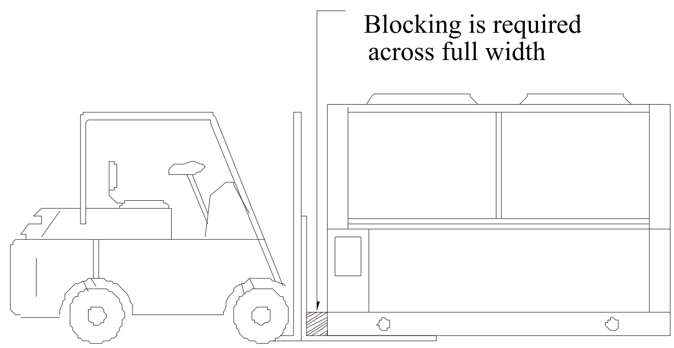
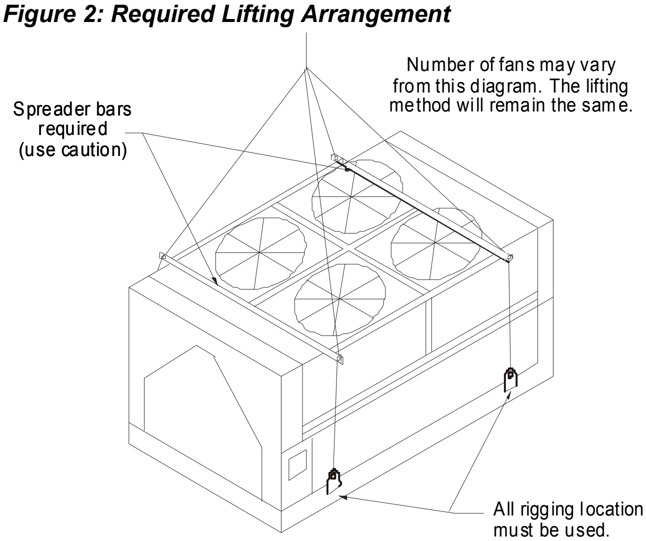


Figure 2: Required Lifting Arrangement



⚠ CAUTION

All lifting locations must be used to prevent damage to unit.

⚠ DANGER

Do not stand beneath the unit while it is being lifted or installed.

Installation and Application Information

Operating and Standby Limits

Table 1: Operating Limits

Maximum standby ambient temperature	131°F (55°C)
Maximum operating ambient temperature	104°F (40°C)
-with optional high ambient package (see information under High Ambient Operation, page 9	125°F (52°C)
Minimum operating ambient temperature (standard control)	32°F (0°C)
Minimum operating ambient temperature (with optional low-ambient control)	-10°F (-23°C)
Leaving chilled water temperature	40°F to 65°F (2°C to 18°C)
Leaving chilled fluid temperatures (with anti-freeze) - Note that in cases of high ambient temperature, the lowest leaving water temperature settings may be outside of the chiller operating envelope; consult Daikin tools to ensure chiller is capable of the required lift.	15°F to 65°F (-9°C to 18°C)
Operating chilled water delta-T range	6°F to 16°F (3.3°C to 8.9°C)
Maximum evaporator operating inlet fluid temperature	81°F (27°C)
Maximum evaporator non-operating inlet fluid temperature	100°F (38°C)

Unit Placement

AGZ units are for outdoor applications and can be mounted either on a roof or at ground level. For roof mounted applications, install the unit on a steel channel or I-beam frame to support the unit above the roof. For ground level applications, install the unit on a substantial base that will not settle. Use a one-piece concrete slab with footings extended below the frost line. Be sure the foundation is level within 0.5” (13mm) over its length and width. The foundation must be strong enough to support the weights listed in the Physical Data Tables beginning on page 15.

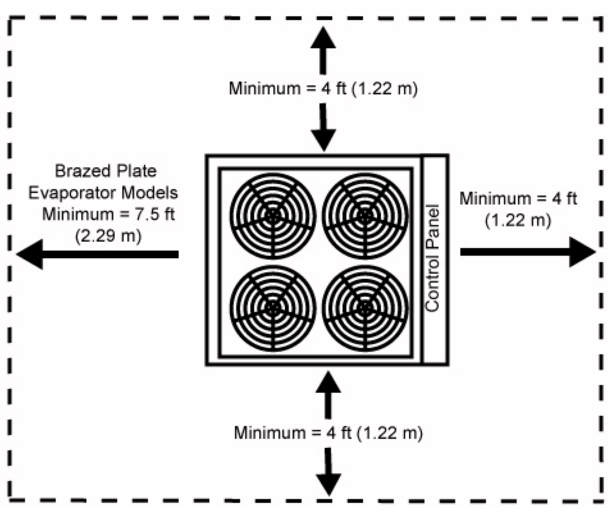
Service Clearance

Sides: Minimum of 4 feet (1.22 m)

Control panel end: Minimum of 4 feet

Opposite control panel:

- Minimum 4 feet on models 030 to 70;



Air Clearance

The Daikin Applied advanced “W” coil design and open air-passage ends allow very close unit spacing and a small installation footprint. The AGZ-E fans are canted inward and reduce recirculation by directing discharge air to the center of the unit, reducing the tendency to flow outward and spill over into the coil inlet.

Sufficient clearance must be maintained between the unit and adjacent walls or other units to allow the required unit air flow to reach the coils. Failure to do so will result in a capacity reduction and an increase in power consumption. No obstructions are allowed above the unit at any height.

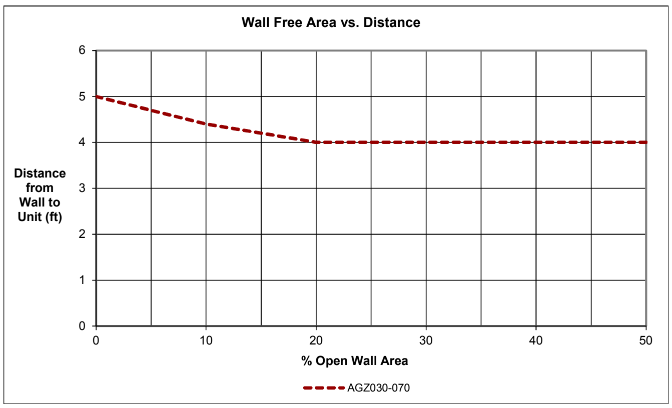
Spacing Requirements

In general, with a small performance penalty in some cases, AGZ-E units can be spaced at four feet from other units or a wall. Curves on the following pages give the minimum clearance for different types of installations and also capacity reduction and power increase if closer spacing is used.

Case 1: Open Screening Walls

Decorative screening walls are often used to help conceal a unit either on grade or on a rooftop. Design these walls such that the combination of their open area and distance from the unit do not require performance adjustment. It is assumed that the wall height is equal to or less than the unit height when mounted on its base support. If the wall height is greater than the unit height, see Case 2 for Pit Installation. The distance from the sides of the unit to the side walls must be sufficient for service, such as opening control panel doors. For uneven wall spacing, the distance from the unit to each wall can be averaged providing no distance is less than 4 feet. Values are based on walls on all four-sides.

Figure 3: Case 1 Adjustment Factor



Case 2: Pit Installation

Pit installations can cause operating problems resulting from air recirculation and restriction, and require care that sufficient air clearance is provided, safety requirements are met and service access is provided. Pit covers must have abundant open area at least equal to the chiller footprint. A solid wall surrounding a unit is substantially a pit and this data should be used.

Steel grating is sometimes used to cover a pit to prevent accidental falls or trips into the pit. The grating material and installation design must be strong enough to prevent such accidents, yet provide abundant open area to avoid recirculation problems. Have any pit installation reviewed by the Daikin Applied sales representative prior to installation to ensure it has sufficient air-flow characteristics and approved by the installation design engineer to avoid risk of accident.

Figure 4: Case 2 - Pit Installation

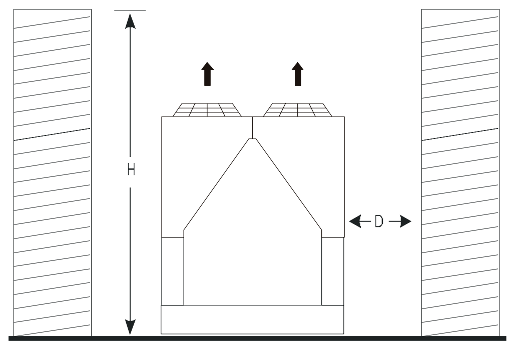
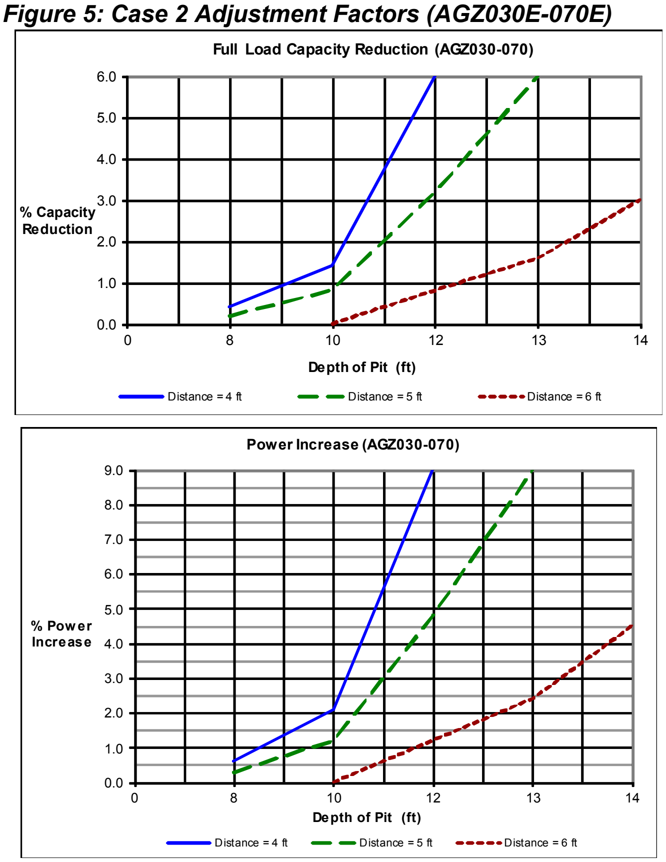


Figure 5: Case 2 Adjustment Factors (AGZ030E-070E)



POE Lubricants

⚠WARNING

Thus unit contains POE lubricants that must be handled carefully and the proper protective equipment (gloves, eye protection, etc.) must be used when handling POE lubricant. POE must not come into contact with any surface or material that might be harmed by POE, including certain polymers (e.g. PVC/CPVC and polycarbonate piping).

Chilled Water Piping

IMPORTANT: Piping design must be provided by a qualified Architect or Systems HVAC Design Engineer familiar with piping design, as well as local codes and regulations. The manufacturer recommendations provided here are to be used as a general guide, but do not replace system design by a qualified professional.

Install a cleanable perforated basket strainer with 0.062-inch perforations and 40% open area for models 030 to 070 in the water line just prior to the inlet of the evaporator. An optional strainer kit is available for factory installation or field mounting.

Design the water piping so the chilled water circulating pump discharges into the evaporator inlet. Connect the return water line to the evaporator inlet connection. Connect the supply water line to the evaporator outlet connection. If not already factory installed, install a flow switch in the horizontal piping of the supply (evaporator outlet) water line.

Provide drain connections at low points in the system to permit complete drainage of the system. Locate air vents at the high points in the system to purge air out of the system. A vent connection on top of the evaporator vessel allows air to be purged out of the evaporator. Purge air from the water system before unit start-up to provide adequate flow through the evaporator.

Units with brazed-plate evaporators (030-070) must have a drain connection provided in the bottom of the lower connection pipe and a vent on the top of the upper connection pipe. These evaporators do not have drain or vent connections due to their construction.

Install pressure gauges in the inlet and outlet water lines to the evaporator. Measure pressure drop through the evaporator and compare to flow as shown on page 18. Vibration eliminators are recommended in both the supply and return water lines.

Insulate chilled water piping to reduce heat loss and prevent condensation. Chillers not running in the winter should have their water systems thoroughly drained to protect against freezing. If the chiller operates year-round, or if the system is not drained for the winter, protect the chilled water piping exposed to outdoor temperature against freezing. Wrap the lines with a heater cable and add proper amount of glycol to the system to further protect the system.

Optional Inlet Strainer

An inlet water strainer kit is available to be field-installed, sized per Table 2 and with the pressure drop show in Figure 6. This pressure drop must be accounted for in the total system pressure drop. The kit consists of:

- (1) Y-type 40% open area strainer with 304 stainless steel perforated basket, Victaulic pipe connections and strainer cap.
- (1) Extension pipe with (2) Schrader fittings that can be used for a pressure gauge and thermal dispersion flow switch. The pipe provides sufficient clearance from the evaporator for strainer basket removal.
- (1) ½-inch blowdown valve.
- (2) Victaulic clamps.

Figure 6: Strainer Pressure Drop

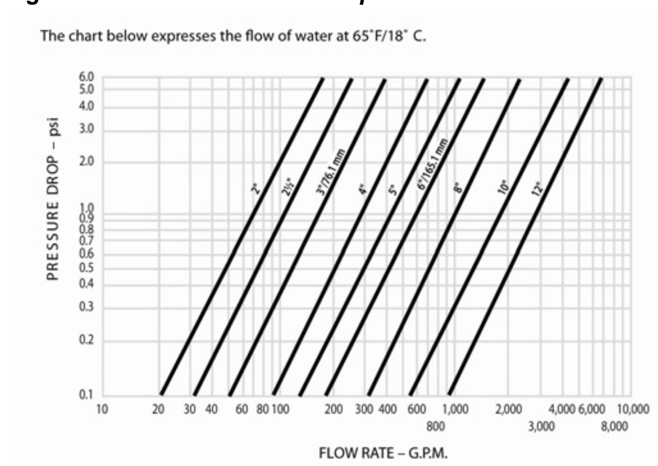


Table 2: Strainer Data

AGZ Model	Strainer Size (in.)	Strainer Plus Pipe Length (in.)	Strainer Weight (lbs)
030-055	2.5	16.75	14
060-070	3.0	17.75	20

Water Flow Limitations

Constant Evaporator Flow

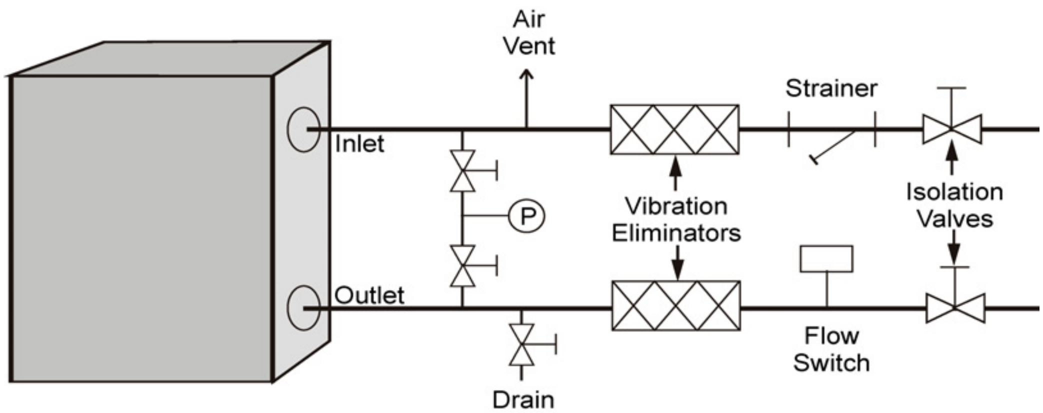
The evaporator flow rates and pressure drops shown on page 18 are for full load design purposes. The maximum flow rate and pressure drop are based on a 6°F temperature drop. Avoid higher flow rates with lower temperature drops to prevent potential control problems resulting from a very small control band and limited start up/shut off temperature changes.

The minimum flow and pressure drop is based on a full load evaporator temperature drop of 16°F. Evaporator flow rates below the minimum values can result in laminar flow causing freeze-up problems, scaling and poor control. Flow rates above the maximum values will result in unacceptable pressure drops and can cause excessive erosion, potentially leading to failure.

Variable Evaporator Flow

Reducing evaporator flow in proportion to load can reduce system power consumption. The rate of flow change should be a maximum of 10 percent of the flow per minute. For example, if the maximum design flow is 200 gpm and it will be reduced to a flow of 140 gpm, the change in flow is 60 gpm. Ten percent of 200 gpm equals 20 gpm change per minute or a minimum of three minutes to go from maximum to minimum. Do not reduce flow lower than the minimum flows listed in the evaporator pressure drop section, page 18. The water flow through the evaporator must remain between the minimum and maximum values listed. If flow drops below the minimum allowable, large reductions in heat transfer can occur. If the flow exceeds the maximum rate, excessive pressure drop and tube erosion can occur.

Figure 7: Typical Piping, Brazed-Plate Evaporator (models AGZ030E-070E)



Install piping with minimum bends and changes in elevation to minimize pressure drop. The following issues should be considered when designing and installing water piping:

1. Vibration eliminators to reduce vibration and noise transmission to the building.
2. Shutoff valves are required to isolate the unit from the piping during unit servicing.
3. Manual or automatic air vent valves at the high points of the system. Drains must be installed at the lowest points in the system.
4. Adequate water pressure must be maintained (expansion tank or regulating valve).
5. Temperature and pressure indicators located at the unit are required to aid in unit servicing.
6. Chilled water piping and strainer must be supported independently from the unit.
7. Flush the system water piping thoroughly before making connections to the unit evaporator. Design the water piping so the chilled water circulating pump discharges into the evaporator inlet.
8. The unit's evaporator has a thermostat and heater to prevent freeze-up down to -20 F (29 C). The heating cable can be wired to a separate 115 V supply circuit. As shipped from the factory, the heating cable is wired to the control circuit. All water piping to the unit must also be protected to prevent freezing.
9. If the unit is used as a replacement chiller, flush the system thoroughly before unit installation. Regular water analysis and chemical water treatment for the evaporator loop is recommended immediately at equipment start-up.
10. The total water volume in the system should be sufficient to prevent frequent "on-off" cycling. Turnover rate should not be less than 4 minutes for normal variable cooling loads.
11. When glycol is added to the water system for freeze protection, the refrigerant suction pressure will be lower, cooling performance less, and water side pressure drop greater. If the percentage of glycol is high, or if propylene is used instead of ethylene glycol, the added pressure drop and loss of performance could be substantial. When Glycol or Ice are selected as Unit Mode, the MicroTech III control will automatically reset the available range for the Leaving Water Temperature, Freezestat and Evaporator Pressure settings.
12. Reset the freezestat setting to 6 degrees F (3.3 degrees C) below the leaving chilled water setpoint temperature after the glycol percentage is verified safe for the application. See the section titled "Glycol Solutions" on page 9 for additional information concerning glycol.

13 Perform a preliminary leak check before insulating the piping and filling the system.

14 Piping insulation should include a vapor barrier to prevent condensation and possible damage to the building structure.

Water Connections

Bring water piping to the evaporator through the side between the vertical supports. Provide taps for the connection of pressure gauges and thermometers in the inlet and outlet lines. Check the inlet and outlet labels on the unit against the certified drawings supplied on the job and be sure the water piping is hooked up correctly. Contact the Daikin Applied sales office if any discrepancies exist.

System Water Volume Considerations

All chilled water systems need adequate time to recognize a load change, respond to that load change and stabilize, without undesirable short cycling of the compressors or loss of control. In air conditioning systems, the potential for short cycling usually exists when the building load falls below the minimum chiller plant capacity or on close-coupled systems with very small water volumes. Some of the things the designer should consider when looking at water volume are the minimum cooling load, the minimum chiller plant capacity during the low load period and the desired cycle time for the compressors. Assuming that there are no sudden load changes and that the chiller plant has reasonable turndown, a rule of thumb of "gallons of water volume equal to two to three times the chilled water gpm flow rate" is often used. A storage tank may have to be added to the system.

BAS should enable chiller only when there is a cooling demand.

Evaporator Freeze Protection

Evaporator freeze-up can be a concern in the application of air-cooled water chillers. To protect against freeze-up, insulation and electric heaters are furnished with the unit; models 030 through 070 have an external plate heater and thermostat. They protect the evaporator down to -20° F (-29° C) ambient air temperature. Although the evaporator is equipped with freeze protection, it does not protect water piping external to the unit or the evaporator itself if there is a power failure or heater cable burnout, or if the chiller is unable to control the chilled water pumps. Use one of the following recommendations for additional protection:

1 If the unit will not be operated during the winter, drain evaporator and chilled water piping and flush with glycol.

2 Add a glycol solution to the chilled water system to provide freeze protection. Freeze point should be approximately ten degrees (F) below minimum design ambient temperature.

3 The addition of thermostatically controlled heat and insulation to exposed piping.

The evaporator heater cable is factory wired to the 115 volt circuit in the control box. This power should be supplied from a separate source, but it can be supplied from the control circuit. Operation of the heaters is automatic through the ambient sensing thermostat that energizes the evaporator heaters for protection against freeze-up. Unless the evaporator is drained in the winter or contains an adequate concentration of anti-freeze, the disconnect switch to the evaporator heater must not be open.

Chilled Water Pump

It is important that the chilled water pumps be wired to, and controlled by, the chiller's microprocessor. When equipped with optional dual pump output, the chiller controller has the capability to selectively send the signal to a pump relay (by others) to start pump A or B or automatically alternate pump selection and also has standby operation capability. The controller will energize the pump whenever at least one circuit on the chiller is enabled to run, whether there is a call for cooling or not. This helps ensure proper unit start-up sequence. The pump will also be turned on when the water temperature reaches 1°F below the Freeze Setpoint to help prevent evaporator freeze-up. Connection points are shown in the Field Wiring Diagram on page 20.

⚠ CAUTION

Adding glycol or draining the system is the recommended method of freeze protection. If the chiller does not have the ability to control the pumps and the water system is not drained in temperatures below freezing, catastrophic evaporator failure may occur.

Failure to allow pump control by the chiller may cause the following problems:

1 If any device other than the chiller attempts to start the chiller without first starting the pump, the chiller will lock out on the No Flow alarm and require manual reset.

2 If the chiller evaporator water temperature drops below the “Freeze setpoint” the chiller will attempt to start the water pumps to avoid evaporator freeze. If the chiller does not have the ability to start the pumps, the chiller will alarm due to lack of water flow.

3 If the chiller does not have the ability to control the pumps and the water system is not to be drained in temperatures below freezing, the chiller may be subject to catastrophic evaporator failure due to freezing. The freeze rating of the evaporator is based on the immersion heater and pump operation. The immersion heater itself may not be able to properly protect the evaporator from freezing without circulation of water.

Low Ambient Operation

Compressor staging is adaptively determined by system load, ambient air temperature, and other inputs to the MicroTech III control. A low ambient option with fan VFD allows operation down to -10° F (-23° C). The minimum ambient temperature is based on still conditions where the wind is not greater than five mph. Greater wind velocities will result in reduced discharge pressure, increasing the minimum operating ambient temperature. Field installed hail/wind guards are available to allow the chiller to operate effectively down to the ambient temperature for which it was designed.

High Ambient Operation

AGZ-E units for high ambient operation (104ºF to 125ºF, 40ºC to 52ºC) require the addition of the optional high ambient package that includes a small fan with a filter in the air intake to cool the control panel.

All units with the optional VFD low ambient fan control automatically include the high ambient option.

Flow Switch

All chillers require a chilled water flow switch to check that there is adequate water flow through the evaporator ant to shut the unit down if there isn't. There are two options for meeting this requirement.

1. A factory-mounted thermal dispersion flow switch.
2. A "paddle" type flow switch is available from Daikin Applied (part number 017503300) for field mounting and wiring. Wire from switch terminals Y and R to the unit control panel terminals shown on the field wiring diagrams, page 21 and page 22. Mount the flow switch in the leaving water line to shut down the unit when water flow is interrupted. A flow switch is an equipment protection control and should never be used to cycle a unit.

Installation should be per manufacturer's instructions included with the switch. Flow switches should be calibrated to shut off the unit when operated below the minimum listed flow rate for the unit as listed on page 18.

There is also a set of normally closed contacts on the switch that can be used for an indicator light or an alarm to indicate when a "no flow" condition exists. Freeze protect any flow switch that is installed outdoors. Differential pressure switches are not recommended for outdoor installation. They can freeze and not indicate a no-flow conditions.

Glycol Solutions

The use of a glycol/water mixture in the evaporator to prevent freezing will reduce system capacity and efficiency, as well as increase pressure drop. The system capacity, required glycol solution flow rate, and pressure drop with glycol may be calculated using the following formulas and tables.

$$\text{Glycol Flow (gpm)} = \frac{CapacityTons}{0.00429 \times Delta - T} \times Flow\ Correction\ Factor$$

1. **Capacity** - Multiply the capacity based on water by the Capacity correction factor from Table 3 or Table 4.
2. **Flow** - Multiply the water evaporator flow by the Flow correction factor from Table 3 or Table 4 to determine the increased evaporator flow due to glycol. If the flow is unknown, it can be calculated from the following equation:
3. **Pressure drop** - Multiply the water pressure drop from Table 15, page 18 by Pressure Drop correction factor from Table 3 or Table 4. High concentrations of propylene glycol at low temperatures may cause unacceptably high pressure drops.
4. **Power** - Multiply the water system power by Power correction factor from Table 3 or Table 4.

Test coolant with a clean, accurate glycol solution hydrometer (similar to that found in service stations) or refractto determine the freezing point. Obtain percent glycol from the freezing point table below. It is recommended that a minimum of 25% solution by weight be used for protection against corrosion or that additional compatible inhibitors be added. Concentrations above 35% do not provide any additional burst protection and should be carefully considered before using.

⚠ CAUTION

Do not use an automotive-grade antifreeze. Industrial grade glycols must be used. Automotive antifreeze contains inhibitors which will cause plating on the copper tubes within the chiller evaporator. The type and handling of glycol used must be consistent with local codes.

Table 3: Ethylene Glycol Factors

% E.G.	Freeze Point		Capacity	Power	Flow	PD
	ºF	ºC				
10	26	-3.3	0.998	0.998	1.036	1.097
20	18	-7.8	0.993	0.997	1.060	1.226
30	7	-13.9	0.987	0.995	1.092	1.369
40	-7	-21.7	0.980	0.992	1.132	1.557
50	-28	-33.3	0.973	0.991	1.182	1.791

Table 4: Propylene Glycol Factors

% P.G.	Freeze Point		Capacity	Power	Flow	PD
	ºF	ºC				
10	26	-3.3	0.995	0.997	1.016	1.100
20	19	-7.2	0.987	0.995	1.032	1.211
30	9	-12.8	0.978	0.992	1.057	1.380
40	-5	-20.6	0.964	0.987	1.092	1.703
50	-27	-32.8	0.952	0.983	1.140	2.251

Lifting and Mounting Weights

Figure 8: Lifting Locations

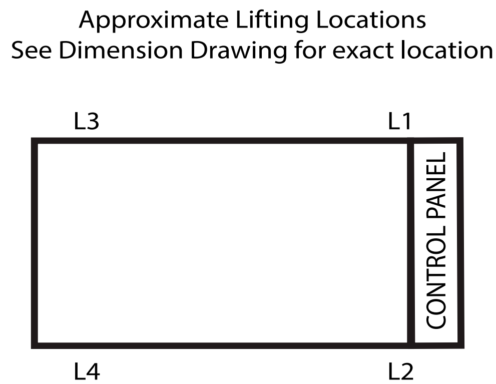


Figure 9: Mounting Locations

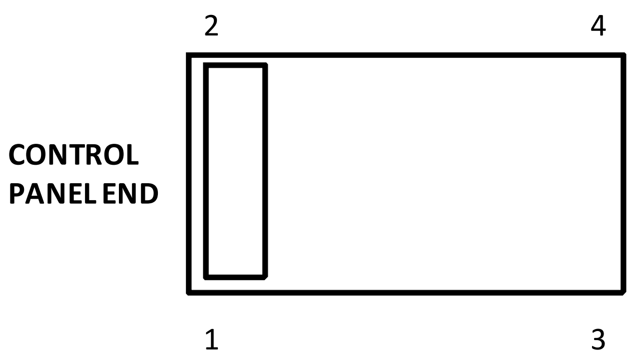


Table 5: Lifting and Mounting Weights - Packaged Chillers with Microchannel Coils

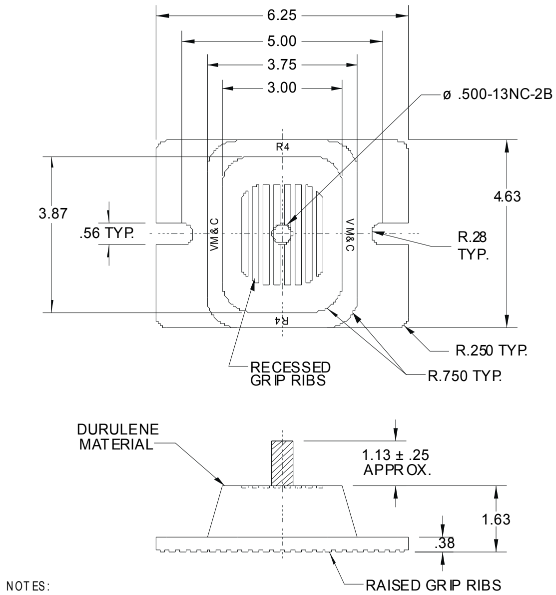
PACKAGE UNITS WITH MICROCHANNEL COILS										
UNIT MODEL	SHIPPING WEIGHT	OPERATING WEIGHT	LIFTING CORNER WEIGHT LBS (KG) BASED ON SHIPPING WEIGHT				MOUNTING WEIGHT LBS (KG) BASED ON OPERATING WEIGHT			
	LBS (KG)	LBS (KG)	L1	L2	L3	L4	M1	M2	M3	M4
AGZ030E	2947 (1337)	2960 (1343)	1011 (459)	799 (362)	635 (288)	502 (228)	980 (445)	775 (352)	673 (305)	532 (241)
AGZ035E	2873 (1303)	2887 (1310)	1051 (477)	861 (391)	528 (240)	433 (196)	1005 (456)	824 (374)	581 (264)	476 (216)
AGZ040E	2948 (1337)	2964 (1344)	1067 (484)	881 (400)	548 (249)	453 (205)	1022 (464)	844 (383)	601 (273)	496 (225)
AGZ045E	3094 (1403)	3112 (1412)	1051 (477)	832 (377)	676 (307)	535 (243)	1021 (463)	809 (367)	715 (324)	567 (257)
AGZ050E	3093 (1403)	3114 (1412)	1049 (476)	837 (380)	671 (304)	536 (243)	1020 (463)	814 (369)	712 (323)	568 (258)
AGZ055E	3106 (1409)	3128 (1419)	1052 (477)	840 (381)	675 (306)	539 (244)	1023 (464)	817 (371)	716 (325)	572 (259)
AGZ060E	3130 (1420)	3155 (1431)	1059 (480)	851 (386)	676 (307)	543 (246)	1031 (468)	828 (376)	718 (326)	577 (262)
AGZ065E	3130 (1420)	3155 (1431)	1059 (480)	851 (386)	676 (307)	543 (246)	1031 (468)	828 (376)	718 (326)	577 (262)
AGZ070E	3472 (1575)	3497 (1586)	1180 (535)	847 (384)	842 (382)	604 (274)	1157 (525)	830 (377)	880 (399)	631 (286)

Table 6: Lifing and Mounting Weights - Packaged Chillers with Copper Tubes and Aluminum Fin Coils

PACKAGE UNITS WITH COPPER TUBE AND ALUMINUM FIN COILS										
UNIT MODEL	SHIPPING WEIGHT	OPERATING WEIGHT	LIFTING CORNER WEIGHT LBS (KG) BASED ON SHIPPING WEIGHT				MOUNTING WEIGHT LBS (KG) BASED ON OPERATING WEIGHT			
	LBS (KG)	LBS (KG)	L1	L2	L3	L4	M1	M2	M3	M4
AGZ030E	3044 (1381)	3057 (1387)	1032 (468)	822 (373)	662 (300)	527 (259)	1002 (454)	798 (362)	700 (318)	558 (253)
AGZ035E	2978 (1351)	2992 (1357)	1075 (488)	887 (402)	556 (252)	459 (208)	1030 (467)	850 (386)	609 (276)	502 (228)
AGZ040E	3030 (1374)	3046 (1382)	1083 (491)	898 (407)	574 (260)	476 (216)	1039 (471)	862 (391)	626 (284)	519 (235)
AGZ045E	3292 (1493)	3310 (1501)	1093 (496)	877 (398)	733 (332)	588 (267)	1065 (483)	854 (387)	772 (350)	619 (281)
AGZ050E	3317 (1505)	3338 (1514)	1098 (498)	886 (402)	737 (334)	595 (270)	1071 (486)	864 (392)	776 (352)	627 (284)
AGZ055E	3334 (1512)	3356 (1522)	1102 (500)	891 (404)	742 (337)	600 (272)	1075 (488)	869 (394)	781 (354)	631 (286)
AGZ060E	3359 (1524)	3384 (1535)	1110 (503)	902 (409)	743 (337)	604 (275)	1083 (491)	880 (399)	784 (356)	637 (289)
AGZ065E	3364 (1526)	3389 (1537)	1110 (503)	903 (410)	745 (338)	606 (275)	1084 (492)	881 (400)	786 (357)	639 (290)
AGZ070E	3709 (1682)	3734 (1674)	1232 (559)	898 (407)	914 (415)	667 (303)	1210 (549)	882 (400)	950 (431)	692 (314)

Figure 10: Spring and RIS Isolators

RP-4 Rubber-in-Shear (RIS)



NOTES:

1. MOUNT MATERIAL TO BE DURULENE RUBBER.
2. MOLDED STEEL AND ELASTOMER MOUNT FOR OUTDOOR SERVICE CONDITIONS.
3. RP-4 MOUNT VERSION WITH STUD IN PLACE.

DRAWING NUMBER 3314814

ALL DIMENSIONS ARE IN DECIMAL INCHES

CP-2 Spring Isolator

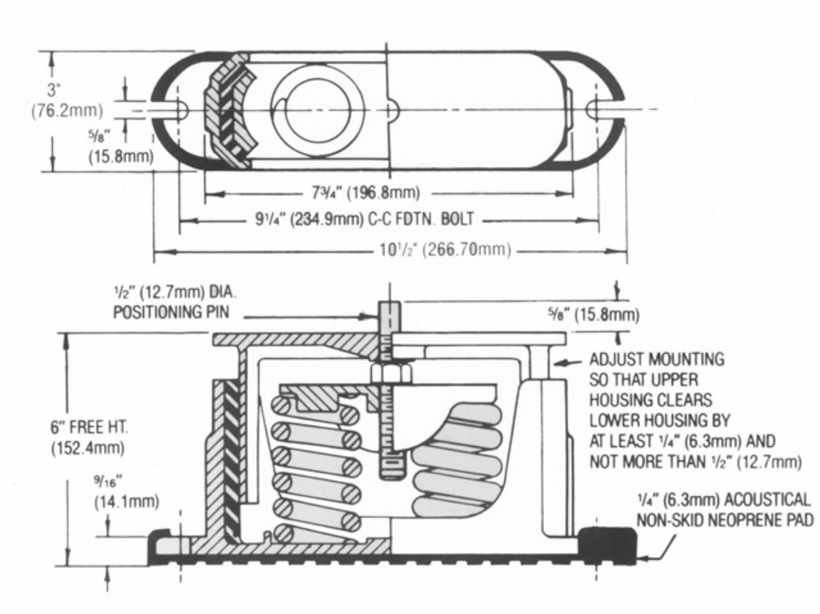


Table 7: Isolator Kit Numbers

Spring Isolator Kit Numbers

AGZ-E Model	Packaged Unit	
	Aluminum Fins	Copper Fins
030	332320102	332320132
035	332320102	332320132
040	332320102	332320132
045	332320132	332320132
050	332320132	332320132
055	332320132	332320132
060	332320132	332320132
065	332320132	332320109
070	332320132	332320109

R-I-S Isolator Kit Numbers

AGZ-E Model	Packaged Unit	
	Aluminum Fins	Copper Fins
030	332325101	332325101
035	332325101	332325101
040	332325101	332325101
045	332325101	332325101
050	332325101	332325101
055	332325101	332325101
060	332325101	332325101
065	332325101	332325101
070	332325101	332325101

Table 8: Isolator Locations (Microchannel and Aluminum Fins/Copper Tubes)

AGZ-E Model	Rubber-In-Shear (RIS) Mounts								Spring Isolator Mountings							
	M1	M2	M3	M4	M5	M6	M7	M8	M1	M2	M3	M4	M5	M6	M7	M8
030	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dk Grn	CP-2 Dk Prpl	CP-2 Black	CP-2 Black				
035	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dk Grn	CP-2 Dk Prpl	CP-2 Black	CP-2 Black				
040	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dk Grn	CP-2 Dk Prpl	CP-2 Black	CP-2 Black				
045	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dk Grn	CP-2 Dk Prpl	CP-2 Dk Prpl	CP-2 Black				
050	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dk Grn	CP-2 Dk Prpl	CP-2 Dk Prpl	CP-2 Black				
055	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dk Grn	CP-2 Dk Prpl	CP-2 Dk Prpl	CP-2 Black				
060	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dk Grn	CP-2 Dk Prpl	CP-2 Dk Prpl	CP-2 Black				
065	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dk Grn	CP-2 Dk Prpl	CP-2 Dk Prpl	CP-2 Black				
070	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dk Grn	CP-2 Dk Prpl	CP-2 Dk Prpl	CP-2 Black				

Table 9: Isolator Locations (Copper Fins)

AGZ-E Model	Rubber-In-Shear (RIS) Mounts								Spring Isolator Mountings							
	M1	M2	M3	M4	M5	M6	M7	M8	M1	M2	M3	M4	M5	M6	M7	M8
030	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dark Grn	CP-2 Dk Purple	CP-2 Dk Purple	CP-2 Black				
035	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dark Grn	CP-2 Dk Purple	CP-2 Dk Purple	CP-2 Black				
040	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dark Grn	CP-2 Dk Purple	CP-2 Dk Purple	CP-2 Black				
045	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dark Grn	CP-2 Dk Purple	CP-2 Dk Purple	CP-2 Black				
050	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dark Grn	CP-2 Dk Purple	CP-2 Dk Purple	CP-2 Black				
055	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dark Grn	CP-2 Dk Purple	CP-2 Dk Purple	CP-2 Black				
060	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dark Grn	CP-2 Dk Purple	CP-2 Dk Purple	CP-2 Black				
065	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dark Grn	CP-2 Dark Grn	CP-2 Dark Grn	CP-2 Black				
070	RP-4 Brown	RP-4 Brown	RP-4 Brown	RP-4 Brown					CP-2 Dark Grn	CP-2 Dark Grn	CP-2 Dark Grn	CP-2 Black				

Lifting and Mounting Weights

Table 10: Seismic Isolator Kit Numbers

AGZ-E Model	Packaged Unit - Aluminum Fins	
	Neoprene Pads	Spring Isolators
030	334549001	334548801
035	334549001	334548801
040	334549001	334548801
045	334549001	334548801
050	334549001	334548801
055	334549001	334548801
060	334549001	334548801
065	334549001	334548801
070	334549001	334548802

Figure 11: Seismic Neoprene Isolation Pads

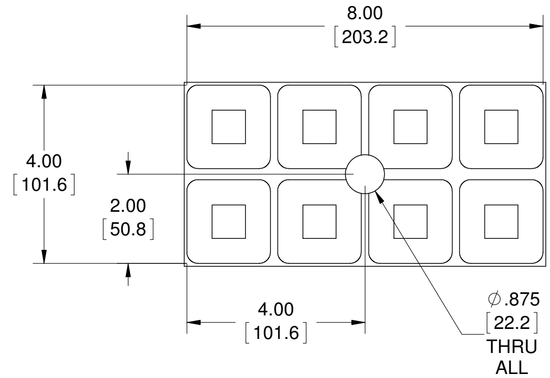


Figure 12: Seismic Spring Isolators

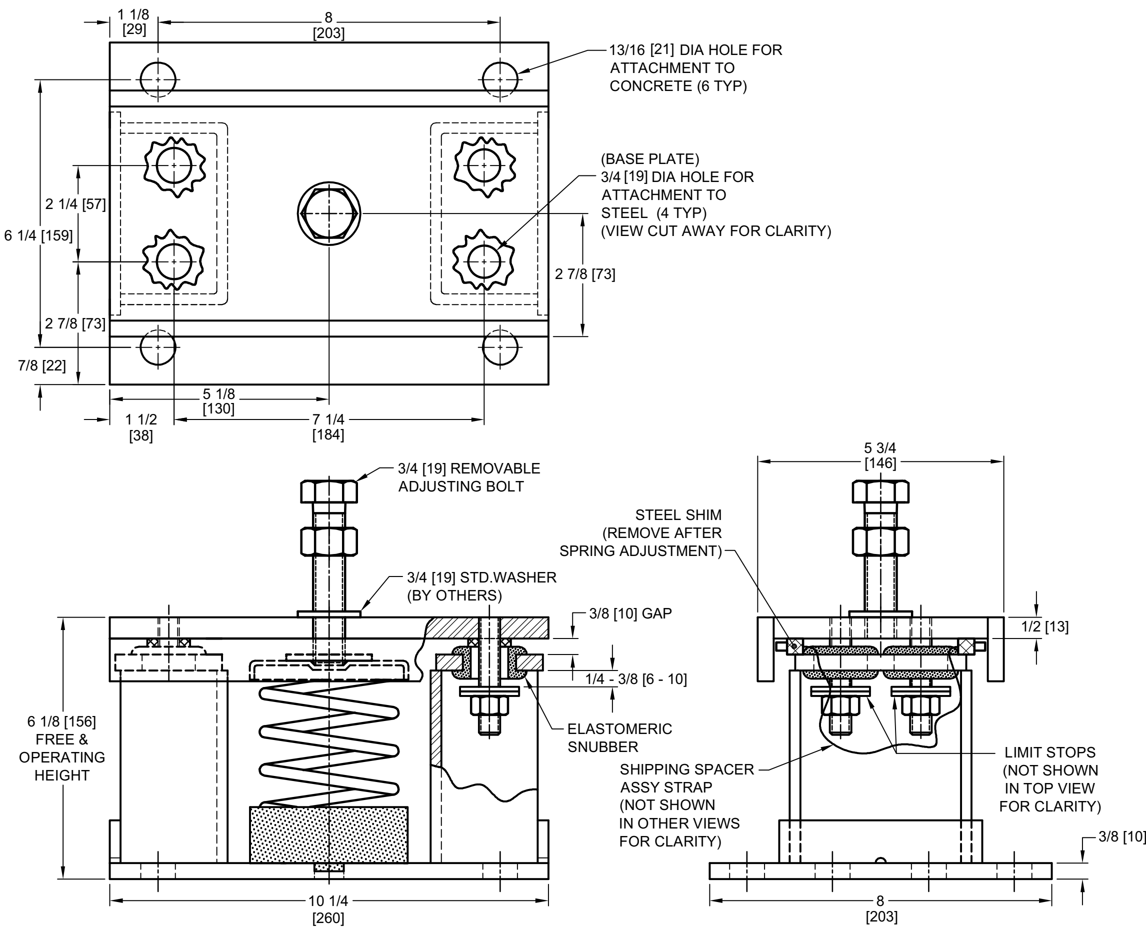


Table 11: Seismic Isolator Locations

AGZ-E Model	Neoprene Pads								Spring Isolators							
	M1	M2	M3	M4	M5	M6	M7	M8	M1	M2	M3	M4	M5	M6	M7	M8
030	Brown	Brown	Brown	Brown					Pink	Pink	Tan	Tan				
035	Brown	Brown	Brown	Brown					Pink	Pink	Tan	Tan				
040	Brown	Brown	Brown	Brown					Pink	Pink	Tan	Tan				
045	Brown	Brown	Brown	Brown					Pink	Pink	Tan	Tan				
050	Brown	Brown	Brown	Brown					Pink	Pink	Tan	Tan				
055	Brown	Brown	Brown	Brown					Pink	Pink	Tan	Tan				
060	Brown	Brown	Brown	Brown					Pink	Pink	Tan	Tan				
065	Brown	Brown	Brown	Brown					Pink	Pink	Tan	Tan				
070	Brown	Brown	Brown	Brown					Pink	Pink	Pink	Tan				

Table 12: Physical Data - AGZ030E - AGZ040E

Physical Data	AGZ-E (Microchannel Packaged Chiller)					
	AGZ030E		AGZ035E		AGZ040E	
	CIRCUIT 1	CIRCUIT 2	CIRCUIT 1	CIRCUIT 2	CIRCUIT 1	CIRCUIT 2
BASIC DATA						
Unit Cap. @ AHRI tons (kW) - See Note 1	28.1 (98.8)		34.9 (122.7)		39.2 (137.9)	
Unit Operating Charge lbs (kg) - Sealed Filter Drier	14 (6.4)	14 (6.4)	14 (6.4)	14 (6.4)	19 (8.6)	19 (8.6)
- Replaceable Core Filter Drier	16 (7.3)	16 (7.3)	16 (7.3)	16 (7.3)	21 (9.5)	21 (9.5)
Unit Dimensions	94.4 x 88 x 100.4		94.4 x 88 x 100.4		94.4 x 88 x 100.4	
L x W x H, in. (mm)	(2398 x 2235 x 2550)		(2398 x 2235 x 2550)		(2398 x 2235 x 2550)	
Package Unit Operating Weight, lbs. (kg)	2960 (1343)		2887 (1310)		2964 (1344)	
Package Unit Shipping Weight, lbs (kg)	2947 (1337)		2873 (1303)		2948 (1337)	
Weight-Add for (Upper) Louvered Panels, lbs (kg)	N/A		N/A		167 (76)	
Weight-Add for (Lower) Louvered Panels, lbs (kg)	144 (65)		144 (65)		144 (65)	
COMPRESSORS, SCROLL, HERMETIC						
Nominal HP	7.5 / 7.5	7.5 / 7.5	9.0 / 9.0	10.0 / 10.0	10.0 / 10.0	10.0 / 10.0
Oil charge per Compressor , oz (g)	85 (2410)	85 (2410)	85 (2410)	85 (2410)	85 (2410)	85 (2410)
Staging, 4 Stages (If Circuit is in Lead)	0-25-50-75-100	0-25-50-75-100	0-23-50-73-100	0-27-50-77-100	0-25-50-75-100	0-25-50-75-100
MICROCHANNEL CONDENSER						
Coil Inlet Face Area, sq. ft. (sq. m.)	24.9 (2.3)	24.9 (2.3)	24.9 (2.3)	24.9 (2.3)	49.8 (4.6)	49.8 (4.6)
Rows Deep/Fins Per Inch	1 / 21	1 / 21	1 / 21	1 / 21	1 / 21	1 / 21
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE						
# of Fans per Circuit - Fan Diameter in (mm)	4 - 30 (762)	4 - 30 (762)	4 - 30 (762)	4 - 30 (762)	4 - 30 (762)	4 - 30 (762)
Fan Motor, hp (kW)	1.5 (1.1)		1.5 (1.1)		1.5 (1.1)	
Fan & Motor RPM	1140		1140		1140	
Fan Tip Speed, fpm (m/s)	8950 (45)		8950 (45)		8950 (45)	
Airflow, cfm (l/s)	34,000 (16047)		34,000 (16047)		40,400 (19,067)	
EVAPORATOR, BRAZED PLATE						
Evaporator, Model (1 Evaporator / 2 Circuits)	ACH-230DQ-78H		ACH-230DQ-86H		ACH-230DQ-94H	
Dry Weight lbs (kg)	84 (38.1)		91 (41.3)		98 (44.5)	
Water Volume, gallons (liters)	2.0 (7.6)		2.2 (8.4)		2.4 (9.2)	
Victaulic inlet/outlet conn. in. (mm)	2.5 (65)		2.5 (65)		2.5 (65)	
Max. Water Pressure, psi (kPa)	653 (4502)		653 (4502)		653 (4502)	
Max. Refrigerant Press., psi (kPa)	653 (4502)		653 (4502)		653 (4502)	

Note 1: Nominal capacity based on 95° F ambient air and 54° F/44° F water range.
Note 2: For all 380V/60 & 575V/60 models, HP = 2.0.
Note 3: Water connection shown is nominal pipe size.
Note 4: Brazed plate evaporators do not have drain or vent connections integral to the heat exchanger. The connections must be installed in the field inlet and outlet piping as shown in Piping Section of IM 1100, available on www.DaikinApplied.com.

Physical Data - Packaged Units

Table 13: Physical Data - AGZ045E - AGZ055E

Physical Data	AGZ-E (Microchannel Packaged Chiller)					
	AGZ045E		AGZ050E		AGZ055E	
	CIRCUIT 1	CIRCUIT 2	CIRCUIT 1	CIRCUIT 2	CIRCUIT 1	CIRCUIT 2
BASIC DATA						
Unit Cap. @ AHRI tons (kW) - See Note 1	42.6 (149.8)		48.3 (169.8)		51.8 (182.1)	
Unit Operating Charge lbs (kg) - Sealed Filter Drier	19 (8.6)	19 (8.6)	19 (8.6)	19 (8.6)	19 (8.6)	19 (8.6)
- Replaceable Core Filter Drier	21 (9.5)	21 (9.5)	21 (9.5)	21 (9.5)	21 (9.5)	21 (9.5)
Unit Dimensions	94.4 x 88 x 100.4		94.4 x 88 x 100.4		94.4 x 88 x 100.4	
L x W x H, in. (mm)	(2398 x 2235 x 2550)		(2398 x 2235 x 2550)		(2398 x 2235 x 2550)	
Package Unit Operating Weight, lbs. (kg)	3112 (1412)		3114 (1412)		3128 (1419)	
Package Unit Shipping Weight, lbs (kg)	3094 (1403)		3093 (1403)		3106 (1409)	
Weight-Add for (Upper) Louvered Panels, lbs (kg)	167 (76)		167 (76)		167 (76)	
Weight-Add for (Lower) Louvered Panels, lbs (kg)	144 (65)		144 (65)		144 (65)	
COMPRESSORS, SCROLL, HERMETIC						
Nominal HP	12.0 / 12.0	12.0 / 12.0	13.0 / 13.0	13.0 / 13.0	13.0 / 13.0	15.0 / 15.0
Oil charge per Compressor , oz (g)	110 (3119)	110 (3119)	110 (3119)	110 (3119)	110 (3119)	110 (3119)
Staging, 4 Stages (If Circuit is in Lead)	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-23-50-73-100	0-27-50-77-100
MICROCHANNEL CONDENSER						
Coil Inlet Face Area, sq. ft. (sq. m.)	49.8 (4.6)	49.8 (4.6)	49.8 (4.6)	49.8 (4.6)	49.8 (4.6)	49.8 (4.6)
Rows Deep/Fins Per Inch	1 / 21	1 / 21	1 / 21	1 / 21	1 / 21	1 / 21
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE						
# of Fans per Circuit - Fan Diameter in (mm)	4 - 30 (762)	4 - 30 (762)	4 - 30 (762)	4 - 30 (762)	4 - 30 (762)	4 - 30 (762)
Fan Motor, hp (kW)	1.5 (1.1)		1.5 (1.1)		1.5 (1.1)	
Fan & Motor RPM	1140		1140		1140	
Fan Tip Speed, fpm (m/s)	8950 (45)		8950 (45)		8950 (45)	
Airflow, cfm (l/s)	40,400 (19,067)		40,400 (19,067)		40,400 (19,067)	
EVAPORATOR, BRAZED PLATE						
Evaporator, Model (1 Evaporator / 2 Circuits)	ACH-230DQ-110H		ACH-230DQ-126H		ACH-230DQ-134H	
Dry Weight lbs (kg)	112 (50.1)		126 (57.2)		133 (60.3)	
Water Volume, gallons (liters)	2.3 (8.7)		2.6 (9.8)		2.8 (10.6)	
Victaulic inlet/outlet conn. in. (mm)	2.5 (65)		2.5 (65)		2.5 (65)	
Max. Water Pressure, psi (kPa)	653 (4502)		653 (4502)		653 (4502)	
Max. Refrigerant Press., psi (kPa)	653 (4502)		653 (4502)		653 (4502)	

Note 1: Nominal capacity based on 95° F ambient air and 54° F/44° F water range.
Note 2: For all 380V/60 & 575V/60 models, HP = 2.0.
Note 3: Water connection shown is nominal pipe size.
Note 4: Brazed plate evaporators do not have drain or vent connections integral to the heat exchanger. The connections must be installed in the field inlet and outlet piping as shown in Piping Section beginning on of IM 1100, available on www.DaikinApplied.com.

Table 14: Physical Data - AGZ060E - AGZ070E

Physical Data	AGZ-E (Microchannel Packaged Chiller)					
	AGZ060E		AGZ065E		AGZ070E	
	CIRCUIT 1	CIRCUIT 2	CIRCUIT 1	CIRCUIT 2	CIRCUIT 1	CIRCUIT 2
BASIC DATA						
Unit Cap. @ AHRI tons (kW) - See Note 1	57.0 (200.5)		58.7 (206.4)		65.1 (228.9)	
Unit Operating Charge lbs (kg) - Sealed Filter Drier	19 (8.6)	19 (8.6)	19 (8.6)	19 (8.6)	20 (9.1)	20 (9.1)
- Replaceable Core Filter Drier	21 (9.5)	21 (9.5)	21 (9.5)	21 (9.5)	22 (10.0)	22 (10.0)
Unit Dimensions L x W x H, in. (mm)	94.4 x 88 x 100.4 (2398 x 2235 x 2550)		94.4 x 88 x 100.4 (2398 x 2235 x 2550)		94.4 x 88 x 100.4 (2398 x 2235 x 2550)	
Package Unit Operating Weight, lbs. (kg)	3155 (1431)		3155 (1431)		3497 (1586)	
Package Unit Shipping Weight, lbs (kg)	3130 (1420)		3130 (1420)		3472 (1575)	
Weight-Add for (Upper) Louvered Panels, lbs (kg)	167 (76)		167 (76)		167 (76)	
Weight-Add for (Lower) Louvered Panels, lbs (kg)	144 (65)		144 (65)		144 (65)	
COMPRESSORS, SCROLL, HERMETIC						
Nominal HP	15.0 / 15.0	15.0 / 15.0	15.0 / 15.0	15.0 / 15.0	15.0 / 20.0	15.0 / 20.0
Oil charge per Compressor , oz (g)	110 (3119)	110 (3119)	110 (3119)	110 (3119)	110 (3119) 152 (4309)	110 (3119) 152 (4309)
Staging, 4 Stages (If Circuit is in Lead)	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-21-50-71-100	0-28-50-78-100
MICROCHANNEL CONDENSER						
Coil Inlet Face Area, sq. ft. (sq. m.)	49.8 (4.6)	49.8 (4.6)	49.8 (4.6)	49.8 (4.6)	49.8 (4.6)	49.8 (4.6)
Rows Deep/Fins Per Inch	1 / 21	1 / 21	1 / 21	1 / 21	1 / 21	1 / 21
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE						
# of Fans per Circuit - Fan Diameter in (mm)	4 - 30 (762)	4 - 30 (762)	4 - 30 (762)	4 - 30 (762)	4 - 30 (762)	4 - 30 (762)
Fan Motor, hp (kW)	1.5 (1.1)		2.0 (1.5)		2.0 (1.5)	
Fan & Motor RPM	1140		1140		1140	
Fan Tip Speed, fpm (m/s)	8950 (45)		8950 (45)		8950 (45)	
Airflow, cfm (l/s)	40,400 (19,067)		48,000 (22654)		48,000 (22654)	
EVAPORATOR, BRAZED PLATE						
Evaporator, Model (1 Evaporator / 2 Circuits)	ACH-230DQ-154H		ACH-230DQ-154H		ACH-230DQ-154H	
Dry Weight lbs (kg)	150 (68.1)		150 (68.1)		150 (68.1)	
Water Volume, gallons (liters)	2.8 (10.6)		2.8 (10.6)		2.8 (10.6)	
Victaulic inlet/outlet conn. in. (mm)	2.5 (65)		2.5 (65)		2.5 (65)	
Max. Water Pressure, psi (kPa)	653 (4502)		653 (4502)		653 (4502)	
Max. Refrigerant Press., psi (kPa)	653 (4502)		653 (4502)		653 (4502)	

Note 1: Nominal capacity based on 95° F ambient air and 54° F/44° F water range.

Note 2: For all 380V/60 & 575V/60 models, HP = 2.0.

Note 3: Water connection shown is nominal pipe size.

Note 4: Brazed plate evaporators do not have drain or vent connections integral to the heat exchanger. The connections must be installed in the field inlet and outlet piping as shown in Piping Section beginning on of IM 1100, available on www.DaikinApplied.com.

Pressure Drop Data

Figure 13: Pressure Drop Curves

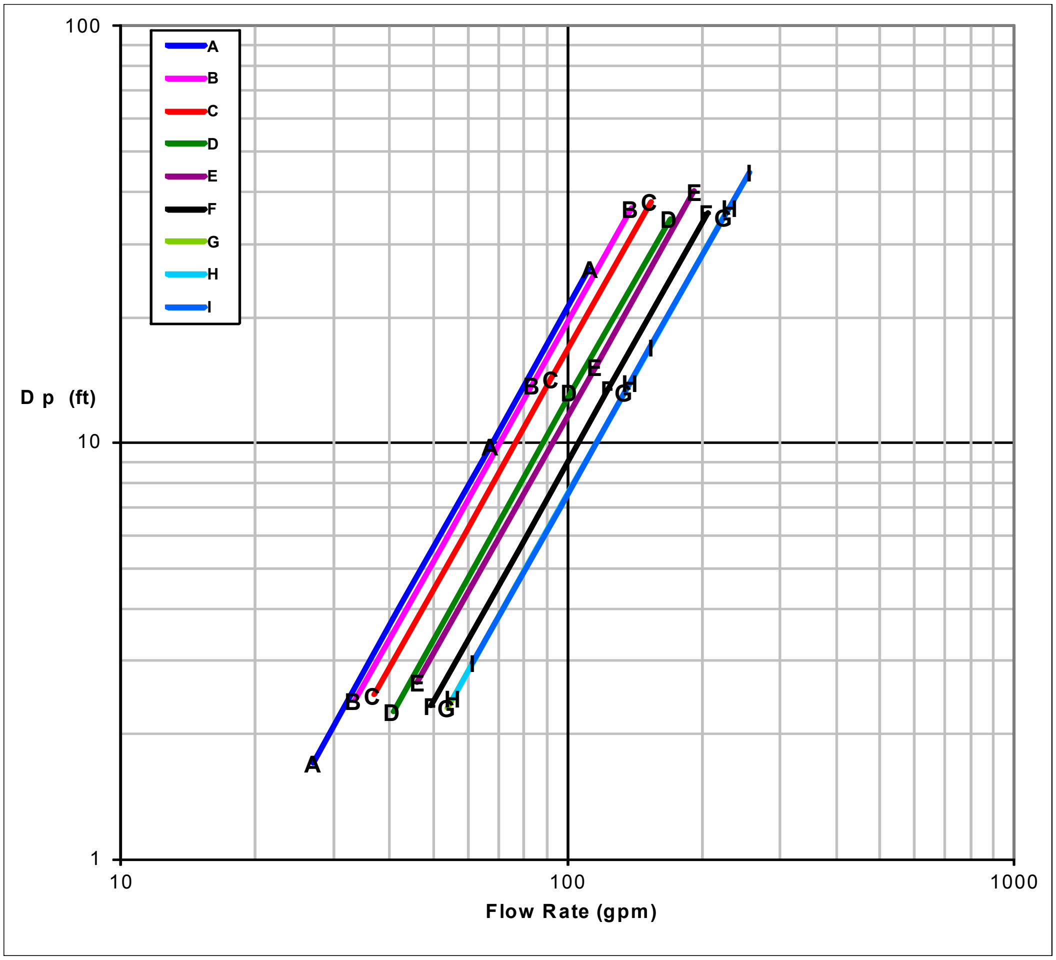


Table 15: Pressure Drop Data

		Variable Flow System Only Minimum Flow Rate				Fixed Flow System Only Minimum Flow Rate				Fixed and Variable Flow Systems Nominal Flow Rate				Fixed and Variable Flow Systems Maximum Flow Rate			
		IP		SI		IP		SI		IP		SI		IP		SI	
Curve Ref.	Model	GPM	DP ft.	lps	DP kpa	GPM	DP ft.	lps	DP kpa	GPM	DP ft.	lps	DP kpa	GPM	DP ft.	lps	DP kpa
A	30E	27.0	1.7	1.7	5.1	42.2	4.0	2.7	12.0	67.4	9.8	4.3	29.4	112.4	26.0	7.1	77.7
B	35E	33.5	2.4	2.1	7.1	52.4	5.6	3.3	16.7	83.8	13.7	5.3	40.9	139.6	36.4	8.8	108.7
C	40E	37.1	2.5	2.3	7.4	57.9	5.8	3.7	17.3	92.6	14.2	5.8	42.5	154.4	37.7	9.7	112.6
D	45E	40.9	2.3	2.6	6.8	63.9	5.3	4.0	15.8	102.2	13.2	6.5	39.4	170.4	34.4	10.8	102.7
E	50E	46.4	2.7	2.9	7.9	72.5	6.2	4.6	18.5	115.9	15.2	7.3	45.3	193.2	40.0	12.2	119.6
F	55E	49.7	2.3	3.1	7.0	77.7	5.5	4.9	16.3	124.3	13.4	7.8	40.0	207.2	35.6	13.1	106.2
G	60E	54.0	2.3	3.4	6.9	84.3	5.4	5.3	16.1	134.9	13.1	8.5	39.3	224.8	34.7	14.2	103.6
H	65E	55.5	2.4	3.5	7.3	86.7	5.7	5.5	17.0	138.7	13.9	8.8	41.4	231.2	36.6	14.6	109.3
I	70E	61.5	3.0	3.9	8.8	96.2	6.9	6.1	20.6	153.8	16.9	9.7	50.4	256.4	44.5	16.2	133.0

Electrical Data Notes

Notes for Unit Amp Draw:

1. Compressor RLA values are for wire sizing purposes only. Normal operating current draw at rated capacity may be less than the RLA value.

Notes for Electrical Data Single- and Multi-Point

1. Unit wire size ampacity (MCA) is equal to 125% of the largest compressor-motor RLA plus 100% of RLA of all other loads in the circuit.
2. The control transformer is furnished and no separate 115V power is required. For both single- and multi-point power connections, the control transformer is in circuit #1 with control power wired from there to circuit #2. In multi-point power, disconnecting power to circuit #1 disconnects control power to the unit.
3. Wire sizing amps is 15 amps if a separate 115V power supply is used for the control circuit.
4. Recommended power lead wire sizes for 3 conductors per conduit are based on 100% conductor ampacity in accordance with NEC. Voltage drop has not been included. It is recommended that power leads be kept short. All terminal block connections must be made with copper (type THW) wire and aluminum wire.
5. Recommended Fuse Sizes are selected at approximately 175% of the largest compressor RLA, plus 100% of all other loads in the circuit.
6. Maximum Fuse or breaker size is equal to 225% of the largest compressor RLA, plus 100% of all other loads.
7. The recommended power wire sizes are based on an ambient temperature of 86°F (30°C). Ampacity correction factors must be applied for other ambient temperatures. Refer to the NEC Handbook.
8. Must be electrically grounded according to national and local electrical codes.

Notes for Wiring Data

1. Single-point power supply requires a single disconnect to supply electrical power to the unit. This power supply must either be fused or use a circuit breaker.
2. Power wiring connections to the chiller may be done with either copper or aluminum wiring. Wire should be sized per NEC and/or local codes. Wire sizing and wire count must fit in the power connection lug sizing starting on page 22.
3. Aluminum wire shall be installed in accordance with NECA/AA 104-2012, *Standard for Installing Aluminum Building Wire and Cable* (ANSI).
4. All field wire size values given in table apply to 75°C rated wire per NEC.

Voltage Limitations:

1. Within 10 percent of nameplate rating.
2. Voltage unbalance not to exceed 2% with a resultant current unbalance of 6 to 10 times the voltage unbalance per NEMA MG-1, 2009 Standard Rev. 1-2010.

Table 16: HSCCR Panel Rating

AGZ-E Model Size	208V-230V	380V-460V	575V
030-070	65kA	65kA	25kA

Table 17: Standard Panel Rating

AGZ-E Model Size	208V	230V	380V	460V	575V
030-070	5kA	5kA	5kA	5kA	5kA

Circuit Breakers

Factory installed compressor circuit breakers are standard on units with single point power supply only. This option provides compressor short circuit protection and makes servicing easier

Electrical Control Center

Operating and equipment protection controls and motor starting components are separately housed in a centrally located, weather resistant control panel with hinged and tool-locked doors. In addition to the MicroTech III controller described in the next sections, the following components are housed in the panel:

- Power terminal blocks, multi-point connection standard
- Control, input, and output terminal block
- Control transformer
- Optional disconnect switch (through-the-door handle)
- Compressor motor inherent thermal and overload protection is standard
- Optional phase voltage monitor with under/over voltage and phase reversal protection
- Fan contactors with short circuit protective devices.
- Optional ground fault protection
- FanTrol fan staging head pressure control system
- Power connections are per the following table

Power Connections

Table 18: Power Connection Availability

Power Connection	Power Block	Disc. Swt.	Comp Circuit Breakers	Panel HSCCR
AGZ030E-070E Optional Single Point	Std	Opt.	Std	Opt
AGZ030E-070E Standard Multi-Point	Std	Opt.	Not Avail.	Opt.

Definitions:

1. Power Block: An electrical device to directly accept field wiring without any disconnecting means.
2. Disconnect Switch: A molded case switch that accepts field wiring and disconnects main power to the entire unit or each main power supply if the multi-point power supply option is selected. This option does not provide overcurrent protection.
3. Compressor Circuit Breakers: A manually reset circuit breaker for each compressor, providing compressor only short circuit protection and located ahead of contactor.
4. Control Panel High Short Circuit Current Rating: (Previously "withstand rating"). The entire control panel is designed for short circuit current rating in Table 16. In the event of a short circuit, the damage is contained within the control panel enclosure.

Field Wiring Diagram

Figure 14: Typical Field Wiring Diagram *(Single-point connection)*

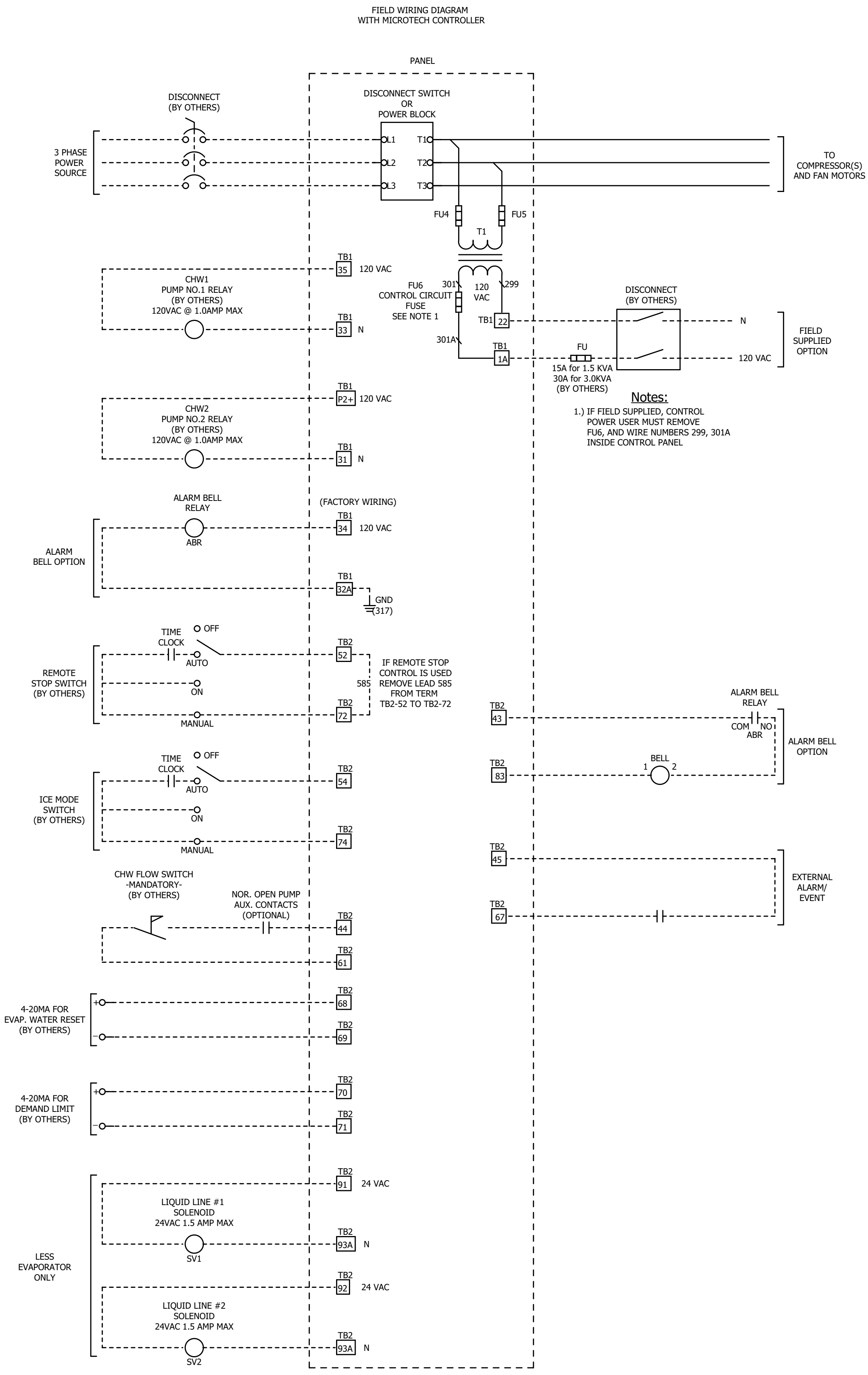
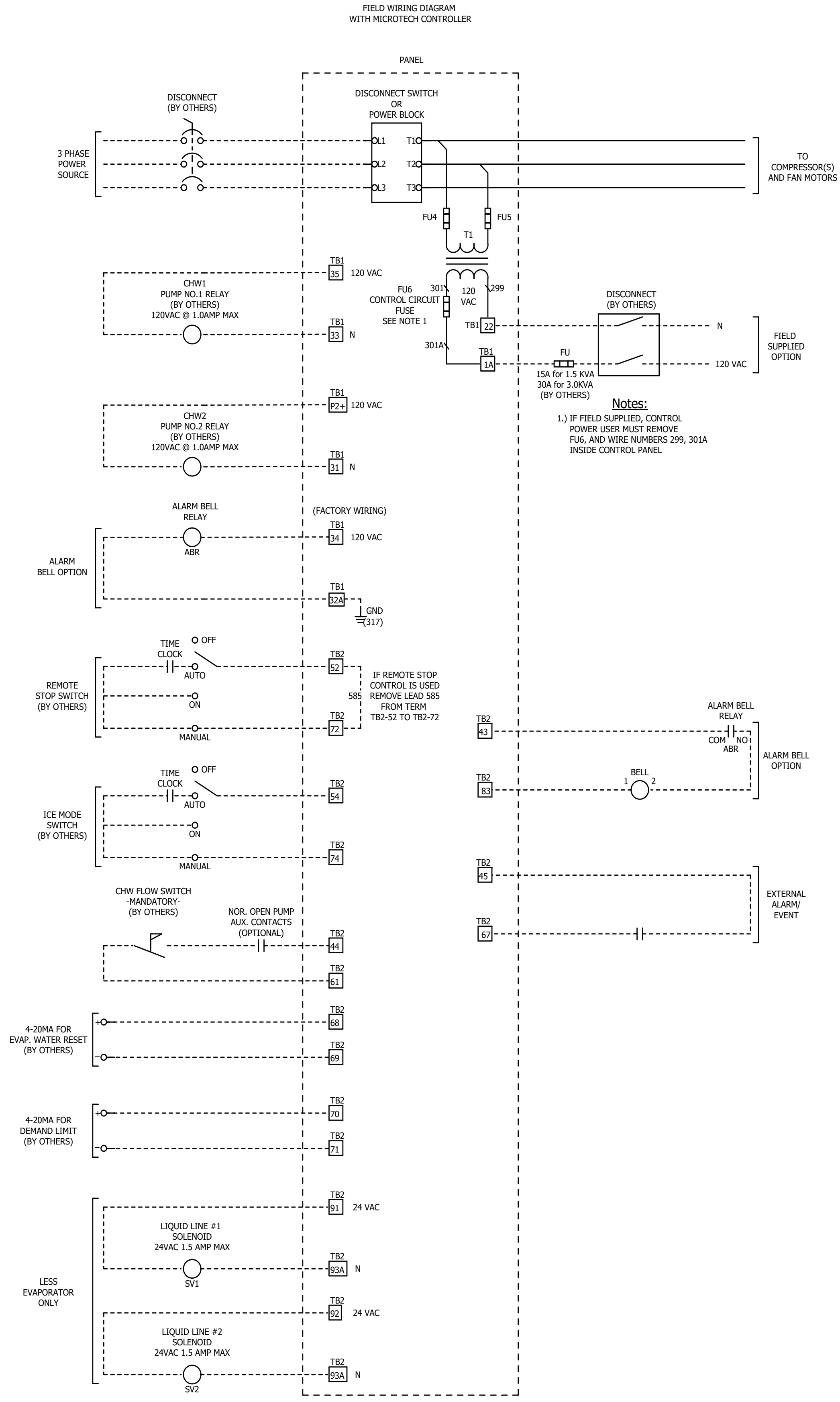


Figure 15: Typical Field Wiring Diagram (Multi-point connection)



Electrical Data

Table 19: Electrical Data - Single Point (50/60 Hz)

Model Size	Voltage	Single Point Field Data				
		Ratings			Lug Range	
		MCA	RFS	MFS	Power Block	Disconnect
030E	208V/60	149	175	175	(1) 14-2/0	(1) 6-350MCM
	230V/60	149	175	175	(1) 14-2/0	(1) 6-350MCM
	380V/60	87	100	100	(1) 14-2/0	(1) 12-1/0
	460V/60	74	80	80	(1) 14-2/0	(1) 12-1/0
	575V/60	64	70	70	(1) 14-2/0	(1) 12-1/0
	400V/50	77	90	90	(1) 14-2/0	(1) 12-1/0
035E	208V/60	163	175	175	(1) 14-2/0	(1) 6-350MCM
	230V/60	163	175	175	(1) 14-2/0	(1) 6-350MCM
	380V/60	96	110	110	(1) 14-2/0	(1) 4-300MCM
	460V/60	77	90	90	(1) 14-2/0	(1) 12-1/0
	575V/60	64	70	70	(1) 14-2/0	(1) 12-1/0
	400V/50	80	90	90	(1) 14-2/0	(1) 12-1/0
040E	208V/60	168	200	200	(1) 14-2/0	(1) 6-350MCM
	230V/60	168	200	200	(1) 14-2/0	(1) 6-350MCM
	380V/60	107	125	125	(1) 14-2/0	(1) 4-300MCM
	460V/60	80	90	90	(1) 14-2/0	(1) 12-1/0
	575V/60	67	80	80	(1) 14-2/0	(1) 12-1/0
	400V/50	83	100	100	(1) 14-2/0	(1) 12-1/0
045E	208V/60	228	250	250	(1) 2-600MCM	(1) 6-350MCM
	230V/60	228	250	250	(1) 2-600MCM	(1) 6-350MCM
	380V/60	117	125	125	(1) 14-2/0	(1) 4-300MCM
	460V/60	90	100	100	(1) 14-2/0	(1) 12-1/0
	575V/60	75	90	90	(1) 14-2/0	(1) 12-1/0
	400V/50	94	110	110	(1) 14-2/0	(1) 4-300MCM
050E	208V/60	241	250	250	(1) 2-600MCM	(2) 3/0-500MCM
	230V/60	241	250	250	(1) 2-600MCM	(2) 3/0-500MCM
	380V/60	131	150	150	(1) 14-2/0	(1) 4-300MCM
	460V/60	109	125	125	(1) 14-2/0	(1) 4-300MCM
	575V/60	97	110	110	(1) 14-2/0	(1) 4-300MCM
	400V/50	107	125	125	(1) 14-2/0	(1) 4-300MCM
055E	208V/60	251	300	300	(1) 2-600MCM	(2) 3/0-500MCM
	230V/60	251	300	300	(1) 2-600MCM	(2) 3/0-500MCM
	380V/60	147	175	175	(1) 14-2/0	(1) 6-350MCM
	460V/60	118	125	125	(1) 14-2/0	(1) 4-300MCM
	575V/60	105	125	125	(1) 14-2/0	(1) 4-300MCM
	400V/50	114	125	125	(1) 14-2/0	(1) 4-300MCM
060E	208V/60	260	300	300	(1) 2-600MCM	(2) 3/0-500MCM
	230V/60	260	300	300	(1) 2-600MCM	(2) 3/0-500MCM
	380V/60	161	175	175	(1) 14-2/0	(1) 6-350MCM
	460V/60	126	150	150	(1) 14-2/0	(1) 4-300MCM
	575V/60	113	125	125	(1) 14-2/0	(1) 4-300MCM
	400V/50	121	125	125	(1) 14-2/0	(1) 4-300MCM
065E	208V/60	268	300	300	(1) 2-600MCM	(2) 3/0-500MCM
	230V/60	268	300	300	(1) 2-600MCM	(2) 3/0-500MCM
	380V/60	161	175	175	(1) 14-2/0	(1) 6-350MCM
	460V/60	129	150	150	(1) 14-2/0	(1) 4-300MCM
	575V/60	113	125	125	(1) 14-2/0	(1) 4-300MCM
	400V/50	121	125	125	(1) 14-2/0	(1) 4-300MCM
070E	208V/60	306	350	350	(1) 2-600MCM	(2) 3/0-500MCM
	230V/60	306	350	350	(1) 2-600MCM	(2) 3/0-500MCM
	380V/60	164	200	200	(1) 14-2/0	(1) 6-350MCM
	460V/60	138	150	150	(1) 14-2/0	(1) 4-300MCM
	575V/60	116	125	125	(1) 14-2/0	(1) 4-300MCM
	400V/50	134	150	150	(1) 14-2/0	(1) 4-300MCM

Note: **1.**For RFS, if the operating ambient is going to be above 105F, then MFS must be used.

2.Power wiring connections to the chiller may be done with either copper or aluminum wiring. Wire should be sized per NEC and/or local codes. Wire sizing and wire count must fit in the power connection lug sizing shown in the above table.

Table 20: Electrical Data - Mutli-point (50/60 Hz)

Model Size	Voltage	Multiple Point Field Data - Circuit #1					Multiple Point Field Data - Circuit #2				
		Ratings			Lug Range		Ratings			Lug Range	
		MCA	RFS	MFS	Power Block	Disc. Switch	MCA	RFS	MFS	Power Block	Disc. Switch
030E	208V/60	78	100	100	(1) 14-2/0	(1) 12-1/0	78	100	100	(1) 14-2/0	(1) 4-300MCM
	230V/60	78	100	100	(1) 14-2/0	(1) 12-1/0	78	100	100	(1) 14-2/0	(1) 4-300MCM
	380V/60	46	60	60	(1) 14-2/0	(1) 12-1/0	46	60	60	(1) 14-2/0	(1) 12-1/0
	460V/60	39	50	50	(1) 14-2/0	(1) 12-1/0	39	50	50	(1) 14-2/0	(1) 12-1/0
	575V/60	34	40	45	(1) 14-2/0	(1) 12-1/0	34	40	45	(1) 14-2/0	(1) 12-1/0
	400V/50	40	50	50	(1) 14-2/0	(1) 12-1/0	40	50	50	(1) 14-2/0	(1) 12-1/0
035E	208V/60	82	100	110	(1) 14-2/0	(1) 4-300MCM	88	110	110	(1) 14-2/0	(1) 4-300MCM
	230V/60	82	100	110	(1) 14-2/0	(1) 4-300MCM	88	110	110	(1) 14-2/0	(1) 4-300MCM
	380V/60	44	60	60	(1) 14-2/0	(1) 12-1/0	56	70	70	(1) 14-2/0	(1) 12-1/0
	460V/60	39	50	50	(1) 14-2/0	(1) 12-1/0	42	50	50	(1) 14-2/0	(1) 12-1/0
	575V/60	32	40	40	(1) 14-2/0	(1) 12-1/0	35	45	45	(1) 14-2/0	(1) 12-1/0
	400V/50	40	50	50	(1) 14-2/0	(1) 12-1/0	44	60	60	(1) 14-2/0	(1) 12-1/0
040E	208V/60	88	110	110	(1) 14-2/0	(1) 4-300MCM	88	110	110	(1) 14-2/0	(1) 4-300MCM
	230V/60	88	110	110	(1) 14-2/0	(1) 4-300MCM	88	110	110	(1) 14-2/0	(1) 4-300MCM
	380V/60	56	70	70	(1) 14-2/0	(1) 12-1/0	56	70	70	(1) 14-2/0	(1) 12-1/0
	460V/60	42	50	50	(1) 14-2/0	(1) 12-1/0	42	50	50	(1) 14-2/0	(1) 12-1/0
	575V/60	35	45	45	(1) 14-2/0	(1) 12-1/0	35	45	45	(1) 14-2/0	(1) 12-1/0
	400V/50	44	60	60	(1) 14-2/0	(1) 12-1/0	44	60	60	(1) 14-2/0	(1) 12-1/0
045E	208V/60	120	150	150	(1) 14-2/0	(1) 4-300MCM	120	150	150	(1) 14-2/0	(1) 6-350MCM
	230V/60	120	150	150	(1) 14-2/0	(1) 4-300MCM	120	150	150	(1) 14-2/0	(1) 6-350MCM
	380V/60	62	80	80	(1) 14-2/0	(1) 12-1/0	62	80	80	(1) 14-2/0	(1) 12-1/0
	460V/60	48	60	60	(1) 14-2/0	(1) 12-1/0	48	60	60	(1) 14-2/0	(1) 12-1/0
	575V/60	39	50	50	(1) 14-2/0	(1) 12-1/0	39	50	50	(1) 14-2/0	(1) 12-1/0
	400V/50	49	60	60	(1) 14-2/0	(1) 12-1/0	49	60	60	(1) 14-2/0	(1) 12-1/0
050E	208V/60	127	150	175	(1) 14-2/0	(1) 6-350MCM	127	150	175	(1) 14-2/0	(1) 6-350MCM
	230V/60	127	150	175	(1) 14-2/0	(1) 6-350MCM	127	150	175	(1) 14-2/0	(1) 6-350MCM
	380V/60	69	90	90	(1) 14-2/0	(1) 12-1/0	69	90	90	(1) 14-2/0	(1) 12-1/0
	460V/60	58	70	80	(1) 14-2/0	(1) 12-1/0	58	70	80	(1) 14-2/0	(1) 12-1/0
	575V/60	51	60	70	(1) 14-2/0	(1) 12-1/0	51	60	70	(1) 14-2/0	(1) 12-1/0
	400V/50	56	70	70	(1) 14-2/0	(1) 12-1/0	56	70	70	(1) 14-2/0	(1) 12-1/0
055E	208V/60	127	150	175	(1) 14-2/0	(1) 6-350MCM	137	175	175	(1) 14-2/0	(1) 6-350MCM
	230V/60	127	150	175	(1) 14-2/0	(1) 6-350MCM	137	175	175	(1) 14-2/0	(1) 6-350MCM
	380V/60	69	90	90	(1) 14-2/0	(1) 12-1/0	85	110	110	(1) 14-2/0	(1) 4-300MCM
	460V/60	58	70	80	(1) 14-2/0	(1) 12-1/0	66	80	90	(1) 14-2/0	(1) 12-1/0
	575V/60	51	60	70	(1) 14-2/0	(1) 12-1/0	59	70	80	(1) 14-2/0	(1) 12-1/0
	400V/50	56	70	70	(1) 14-2/0	(1) 12-1/0	64	80	80	(1) 14-2/0	(1) 12-1/0
060E	208V/60	137	175	175	(1) 14-2/0	(1) 6-350MCM	137	175	175	(1) 14-2/0	(1) 6-350MCM
	230V/60	137	175	175	(1) 14-2/0	(1) 6-350MCM	137	175	175	(1) 14-2/0	(1) 6-350MCM
	380V/60	85	110	110	(1) 14-2/0	(1) 4-300MCM	85	110	110	(1) 14-2/0	(1) 4-300MCM
	460V/60	66	80	90	(1) 14-2/0	(1) 12-1/0	66	80	90	(1) 14-2/0	(1) 12-1/0
	575V/60	59	70	80	(1) 14-2/0	(1) 12-1/0	59	70	80	(1) 14-2/0	(1) 12-1/0
	400V/50	64	80	80	(1) 14-2/0	(1) 12-1/0	64	80	80	(1) 14-2/0	(1) 12-1/0
065E	208V/60	141	175	175	(1) 14-2/0	(1) 6-350MCM	141	175	175	(1) 14-2/0	(1) 6-350MCM
	230V/60	141	175	175	(1) 14-2/0	(1) 6-350MCM	141	175	175	(1) 14-2/0	(1) 6-350MCM
	380V/60	85	110	110	(1) 14-2/0	(1) 4-300MCM	85	110	110	(1) 14-2/0	(1) 4-300MCM
	460V/60	68	80	90	(1) 14-2/0	(1) 12-1/0	68	80	90	(1) 14-2/0	(1) 12-1/0
	575V/60	59	70	80	(1) 14-2/0	(1) 12-1/0	59	70	80	(1) 14-2/0	(1) 12-1/0
	400V/50	64	80	80	(1) 14-2/0	(1) 12-1/0	64	80	80	(1) 14-2/0	(1) 12-1/0
070E	208V/60	162	200	225	(1) 14-2/0	(1) 6-350MCM	162	200	225	(1) 14-2/0	(1) 6-350MCM
	230V/60	162	200	225	(1) 14-2/0	(1) 6-350MCM	162	200	225	(1) 14-2/0	(1) 6-350MCM
	380V/60	86	110	110	(1) 14-2/0	(1) 4-300MCM	86	110	110	(1) 14-2/0	(1) 4-300MCM
	460V/60	73	90	100	(1) 14-2/0	(1) 12-1/0	73	90	100	(1) 14-2/0	(1) 4-300MCM
	575V/60	61	80	80	(1) 14-2/0	(1) 12-1/0	61	80	80	(1) 14-2/0	(1) 12-1/0
	400V/50	71	90	100	(1) 14-2/0	(1) 12-1/0	71	90	100	(1) 14-2/0	(1) 4-300MCM

Note: **1.**For RFS, if the operating ambient is going to be above 105F, then MFS must be used.

2.Power wiring connections to the chiller may be done with either copper or aluminum wiring. Wire should be sized per NEC and/or local codes. Wire sizing and wire count must fit in the power connection lug sizing shown in the above table.

Unit Controller Operation

Overview

The MicroTech® III controller's state-of-the-art design not only permits the chiller to run more efficiently, but also can simplify troubleshooting if a system failure occurs. Every MicroTech IIII controller is programmed and tested prior to shipment to facilitate start-up.

The controller menu structure is separated into three distinct categories that provide the operator or service technician with a full description of :

1 current unit status

2 control parameters

3 alarms. Security protection prevents unauthorized changing of the setpoints and control parameters.

MicroTech III control continuously performs self-diagnostic checks, monitoring system temperatures, pressures and protection devices, and will automatically shut down a compressor or the entire unit should a fault occur. The cause of the shutdown will be retained in memory and can be easily displayed in plain English for operator review. The MicroTech III chiller controller will also retain and display the date/time the fault occurred. In addition to displaying alarm diagnostics, the MicroTech III chiller controller also provides the operator with a warning of limit (pre-alarm) conditions.

Controller Inputs and Outputs

Main Controller

Table 21: Analog Inputs

#	Description	Type	Expected Range
AI1	Evaporator EWT	NTC 10k	340 to 300k Ω
AI2	Evaporator LWT	NTC 10k	340 to 300k Ω
AI3	Outside Ambient Temperature	NTC 10k	340 to 300k Ω
X1	Demand Limit	4-20 mA	1 to 23 mA
X4	LWT Reset	4-20 mA	1 to 23 mA

Table 22: Analog Outputs

#	Description	Output Type	Range
X5	Circuit 1 Fan VFD Speed	Voltage	0 to 10 volts
X6	Circuit 2 Fan VFD Speed	Voltage	0 to 10 volts

Table 23: Digital Inputs

	Description	Signal Off	Signal On
DI1	External Alarm/Event	External Fault	No External Fault
DI2	Evaporator Flow Switch	No Flow	Flow
DI3	Double Set Point/ Mode Switch	See sections on Unit Mode Selection and LWT Target	
DI4	Remote Switch	Remote Disable	Remote Enable
DI5	Unit Switch	Unit Disable	Unit Enable

Table 24: Digital Outputs

	Description	Output Off	Output On
DO1	Evaporator Water Pump 1	Pump Off	Pump On
DO2	Alarm Indicator	Alarm Not Active	Alarm Active
DO3	Circuit 1 Fan Output 1	Fan(s) Off	Fan(s) On
DO4	Circuit 1 Fan Output 2	Fan(s) Off	Fan(s) On
DO5	Circuit 1 Fan Output 3	Fan(s) Off	Fan(s) On
DO6	Circuit 1 Fan Output 4	Fan(s) Off	Fan(s) On
DO7	Circuit 2 Fan Output 1	Fan(s) Off	Fan(s) On
DO8	Circuit 2 Fan Output 2	Fan(s) Off	Fan(s) On
DO9	Circuit 2 Fan Output 3	Fan(s) Off	Fan(s) On
DO10	Circuit 2 Fan Output 4	Fan(s) Off	Fan(s) On

Compressor Module 1

Table 25: Analog Inputs

	Description	Signal Type	Expected Range
X1	Circuit 1 Suction Temperature	NTC 10k	340 to 300k Ω
X2	Circuit 1 Evaporator Pressure	Voltage	0.4 to 4.6 volts
X4	Circuit 1 Condenser Pressure	Voltage	0.4 to 4.6 volts

Table 26: Digital Inputs

	Description	Signal Off	Signal On
X6	Circuit 1 Switch	Circuit Disable	Circuit Enable
X7	Circuit 1 MHP Switch	Fault	No fault
X8	Circuit 1 Motor Protection	Fault	No fault
DI1	Circuit 1 (or Unit) PVM/GFP	Fault	No fault

Note: The Motor Protection and MHP input signal are wired in series. If Motor Protection input is open, MHP Switch input will also be open.

Table 27: Digital Outputs

	Description	Output Off	Output On
DO1	Compressor #1	Compressor Off	Compressor On
DO2	Compressor #3	Compressor Off	Compressor On
DO3	Compressor #5	Compressor Off	Compressor On
DO4	Evaporator Water Pump 2	Pump Off	Pump On
DO5	Circuit 1 Hot Gas Bypass SV	Solenoid Closed	Solenoid Open
DO6	Circuit 1 Liquid Line SV	Solenoid Closed	Solenoid Open

Compressor Module 2

Table 28: Analog Inputs

	Description	Signal Type	Expected Range
X1	Circuit 2 Suction Temperature	NTC 10k	340 to 300k Ω
X2	Circuit 2 Evaporator Pressure	Voltage	0.4 to 4.6 volts
X4	Circuit 2 Condenser Pressure	Voltage	0.4 to 4.6 volts

Table 29: Digital Inputs

	Description	Signal Off	Signal On
X6	Circuit 2 Switch	Circuit Disable	Circuit Enable
X7	Circuit 2 MHP Switch	Fault	No fault
X8	Circuit 2 Motor Protection	Fault	No fault
DI1	Circuit 2 PVM/GFP	Fault	No fault

Note: The Motor Protection and MHP input signal are wired in series. If Motor Protection input is open, MHP Switch input will also be open.

Table 30: Digital Outputs

	Description	Output Off	Output On
DO1	Compressor #2	Compressor Off	Compressor On
DO2	Compressor #4	Compressor Off	Compressor On
DO3	Compressor #6	Compressor Off	Compressor On
DO5	Circuit 2 Hot Gas Bypass SV	Solenoid Closed	Solenoid Open
DO6	Circuit 2 Liquid Line SV	Solenoid Closed	Solenoid Open

EXV Module 1 and 2

These modules will be used only when the expansion valve type is electronic.

Table 31: Digital Outputs

	Description	Output Off	Output On
DO1	Circuit 1 Fan Output 5	Fan(s) Off	Fan(s) On

Table 32: Stepper Motor Output

	Description
M1+, M1-	EXV Stepper Coil 1
M2+, M2-	EXV Stepper Coil 2

RapidRestore®

This module will be used only when the unit is equipped with the RapidRestore option.

Table 33: Digital Inputs

	Description	Signal Off	Signal On
DI1	RapidRestore Enable	Disable RapidRestore	Allow RapidRestore Enabling
DI2	Backup Chiller Designation	Not Backup Chiller	Backup Chiller

Sensor Information

Temperature

All temperature sensors will be Daikin part number 1934146.

Pressure

Pressure inputs will be read using 0 to 5 volt ratiometric sensors. Nominal voltage range will be 0.5 to 4.5 volts.

Pressure on the low side will be measured using Daikin part number 331764501.

Pressure on the high side will be measured using Daikin part number 331764601.

Setpoints

Setpoints are stored in permanent memory.

SetPoint Tables

Setpoints are initially set to the values in the **Default** column, and can be adjusted to any value in the **Range** column.

Unit Level Setpoints:

Description	Default	Range
Mode/Enabling		
Unit Enable	Enable	Disable, Enable
Network Unit Enable	Disable	Disable, Enable
Control source	Local	Local, Network
Available Modes	Cool	Cool, Cool w/Glycol, Cool/Ice w/Glycol, Ice, Test
Network Mode Command	Cool	Cool, Ice
Staging and Capacity Control		
Cool LWT 1	7°C (44.6°F)	See Auto Adjusted Ranges
Cool LWT 2	7°C (44.6°F)	See Auto Adjusted Ranges
Ice LWT	4.4°C (39.9°F)	-9.5 to 4.4 °C (14.9 to 39.9 °F)
Network Cool Set Point	7°C (44.6°F)	See Auto Adjusted Ranges
Network Ice Set Point	4.4°C (39.9°F)	-9.5 to 4.4 °C (14.9 to 39.9 °F)
Startup Delta T	5.6°C (10.1°F)	0.6 to 8.3 °C (1.1 to 14.9 °F)
Shut Down Delta T	0.3°C (0.5°F)	0.3 to 1.7 °C (0.5 to 3.1 °F)
Max Pulldown	0.6°C/min (1.1°F/min)	0.1 to 2.7 °C/min (0.2 to 4.9 °F/min)
Nominal Evap Delta T	5.6 °C (10.1°F)	3.3 to 8.9 °C (5.9 to 16 °F)
Demand Limit Enable	Off	Off, On
Network Capacity Limit	100%	0 to 100%
LWT Reset Enable	Off	Off, On
Configuration		
Power Input	Single Point	Single Point, Multi Point
Evap Control	#1 Only	#1 Only, #2 Only, Auto, #1 Primary, #2 Primary
Number of Compressors	4	4,6
Expansion Valve Type	Thermal	Thermal, Electronic
Fan VFD enable	No	No, Yes
Number of fans	4	4,6,8,10,12,14
Timers		
Evap Recirc Timer	30	15 to 300 seconds
Stage Up Delay	240 sec	120 to 480 sec
Stage Down Delay	30 sec	20 to 60 sec
Stage Delay Clear	No	No, Yes
Start-start timer	15 min	10-60 minutes
Stop-start timer	5 min	3-20 minutes
Clear Cycle Timers	No	No, yes
Ice Time Delay	12	1-23 hours
Clear Ice Timer	No	No,Yes
Sensor Offsets		
Evap LWT sensor offset	0°C (0°F)	-5.0 to 5.0 °C (-9.0 to 9.0 °F)
Evap EWT sensor offset	0°C (0°F)	-5.0 to 5.0 °C (-9.0 to 9.0 °F)
OAT sensor offset	0°C (0°F)	-5.0 to 5.0 °C (-9.0 to 9.0 °F)
Alarm Settings		
Low Evap Pressure Unload	689.5 KPA(100 PSI)	See Auto Adjusted Ranges
Low Evap Pressure Hold	696.4 KPA(101 PSI)	See Auto Adjusted Ranges
High Condenser Pressure	4240 KPA(615 PSI)	3310 to 4275 KPA (480 to 620 PSI)
High Condenser Pressure Unload	4137 KPA(600 PSI)	3241 to 4137 KPA (470 to 600 PSI)
Evaporator Flow Proof	5 sec	5 to 15 sec
Evaporator Water Freeze	2.2°C (36°F)	See Auto Adjusted Ranges
Low OAT Start Time	165 sec	150 to 240 sec
Low Ambient Lockout	0°C (32°F)	See Auto Adjusted Ranges
External Alarm Configuration	Event	Event, Alarm
Clear Alarms	Off	Off, On
Network Clear Alarms	Off	Off, On

Circuit Setpoints (exist individually for each circuit):

Description	Default	Range
Mode/Enabling		
Circuit mode	Enable	Disable, Enable, Test
Compressor 1 Enable	Enable	Enable, Disable
Compressor 2 Enable	Enable	Enable, Disable
Compressor 3 Enable	Enable	Enable, Disable
Network Compressor 1 Enable	Enable	Enable, Disable
Network Compressor 2 Enable	Enable	Enable, Disable
Network Compressor 3 Enable	Enable	Enable, Disable
EXV control	Auto	Auto, manual
EXV position	See Special Setpoints	0% to 100%
Suction SH Target	5.56°C (10°F)	4.44 to 6.67 °C (8 to 12 °F)
Max Evap Pressure	1076 KPA(156.1 PSI)	979 to 1172 KPA (142 to 170 PSI)
Condenser		
Condenser Target 100%	37.8°C (100°F)	32.22 to 48.9 °C (90 to 120 °F)
Condenser Target 67%	32.2°C (90°F)	32.22 to 48.9 °C (90 to 120 °F)
Condenser Target 50%	32.2°C (90°F)	29.44 to 43.3 °C (85 to 110 °F)
Condenser Target 33%	29.4°C (85°F)	29.44 to 43.3 °C (85 to 110 °F)
VFD Max Speed	100%	90 to 110%
VFD Min Speed	25%	25 to 60%
Fan Stage Up Deadband 1	8.33°C (15°F)	8.33 to 13.89 °C (15 to 25 °F)
Fan Stage Up Deadband 2	5.56°C (10°F)	5.56 to 8.33 °C (10 to 15 °F)
Fan Stage Up Deadband 3	5.56°C (10°F)	5.56 to 8.33 °C (10 to 15 °F)
Fan Stage Up Deadband 4	5.56°C (10°F)	5.56 to 8.33 °C (10 to 15 °F)
Fan Stage Down Deadband 1	11.11°C (20°F)	8.33 to11.11 °C (15 to 20 °F)
Fan Stage Down Deadband 2	11.11°C (20°F)	8.33 to11.11 °C (15 to 20 °F)
Fan Stage Down Deadband 3	8.33 °C (15 °F)	5.56 to 8.33 °C (10 to 15 °F)
Fan Stage Down Deadband 4	5.56 °C (10 °F)	3.33 to 5.56 °C (6 to 10 °F)
Sensor Offsets		
Evap pressure offset	0 KPA (0 PSI)	-100 to 100 KPA (-14.5 to 14.5 PSI)
Cond pressure offset	0 KPA (0 PSI)	-100 to 100 KPA (-14.5 to 14.5 PSI)
Suction temp offset	0°C (0°F)	-5.0 to 5.0 °C (-9.0 to 9.0 °F)

Note: Condenser Target 50% will be available only when Number of Compressors is 4.

Auto Adjusted Ranges

Some settings have different ranges of adjustment based on other settings:

Cool LWT 1, Cool LWT 2, and Network Cool Set Point	
Available Mode Selection	**Range**
Without Glycol	4.4 to 18.3 °C (39.9 to 65°F)
With Glycol	-9.5 to 18.3 °C (14.9 to 65 °F)

Evaporator Water Freeze	
Available Mode Selection	**Range**
Without Glycol	2.2 to 5.6 °C (36 to 42.1 °F)
With Glycol	-10.8 to 5.6 °C (12.6 to 42.1 °F)

Low Evaporator Pressure Hold and Unload	
Available Mode Selection	**Range**
Without Glycol	669 to 793 KPA (97 to 115 PSI)
With Glycol	407 to 793 KPA (59 to 115 PSI)

Low Ambient Lockout	
Fan VFD	**Range**
= no for all circuits	0 to 18.3 °C (32 to 65 °F)
= yes on any circuit	-23.3 to 18.3 °C (-9.9 to 65 °F)

Special Set Point Operations

The following setpoints are not changeable unless the unit switch is off:

- Available Modes
- Number of Compressors
- Expansion Valve Type
- Number of Fans
- Fan VFD Enable

The Circuit Mode setpoints should not be changeable unless the corresponding circuit switch is off.

The Compressor Enable setpoints should not be changeable unless the corresponding compressor is not running.

EXV Position set point on each circuit follows the actual EXV position while EXV Control = Auto. When EXV Control = Manual, the position set point should be changeable.

The Clear Alarms and Network Clear Alarms settings are automatically set back to Off after being On for 1 second.

Security

All setpoints are protected using passwords. A four-digit password provides operator access to changeable parameters. Service level passwords are reserved for authorized service personnel.

Operator password: 2526

Entering Passwords

Passwords are entered on the first screen on the unit controller,

If the wrong password is entered, a message will temporarily appear stating this. If no valid password is active the active password level displays “none.”

Editing Setpoints

After a valid password has been entered at the unit controller, setpoints may be changed. If the operator attempts to edit a setpoint for which the necessary password level is not active, no action will be taken.

Once a password has been entered, it remains valid for 10 minutes after the last key-press on the unit controller.

Unit Functions

Definitions

The calculations in this section are used in unit level and circuit control logic.

LWT Slope

LWT slope is calculated such that the slope represents the estimated change in LWT over a time frame of one minute.

Pulldown Rate

The slope value calculated above will be a negative value as the water temperature is dropping. A pulldown rate is calculated by inverting the slope value and limiting to a minimum value of 0°C/min.

LWT Error

LWT error is calculated as:

LWT – LWT target

Unit Capacity

For applying unit capacity limits, an estimate of total unit capacity is needed. Unit capacity will be based on the estimated circuit capacities.

The unit capacity is the number of compressors running (on circuits that are not pumping down) divided by the number of compressors on the unit.

Control Band

The Control Band defines the band in which unit capacity will not be increased or decreased.

The Control Band is calculated as follows for constant evaporator flow:

- Four compressor units: Control Band = Nominal Evap Delta T Set Point * 0.3
- Six compressor units: Control Band = Nominal Evap Delta T Set Point * 0.2

When Variable Evaporator Flow is required, the control band increases as capacity decreases to account for the decrease in flow. It is assumed that the flow will vary to maintain the full capacity evaporator temperature delta at part load conditions. The control band is limited at each capacity step to a maximum value that corresponds to the minimum flow for that capacity step.

Since evaporator flow is represented by the set point Full Capacity Evaporator Delta T, the calculations of the control band for variable flow applications are explained in terms of delta T also. The term ‘Effective Full Capacity Delta T’ means the approximate temperature delta that would be observed with the unit running at full capacity for the given flow. ‘Nominal flow’ means the flow that is needed for a 5.56°C (10°F) delta T at full unit capacity.

Table 34: Minimum Flows and Corresponding Maximum Effective Full Capacity Delta T:

Number of Compressors	Unit Capacity	Minimum Flow (nominal %)	Max Effective Full Capacity DT
4	100%	62.5%	8.9 °C (16 °F)
	75%	55%	10.1 °C (18.2 °F)
	50%	47.5%	11.7 °C (21.1 °F)
	25%	40%	13.9 °C (25 °F)

For variable evaporator flow, the Control Band is calculated as follows:

1. Effective Full Capacity Delta T = (Full Capacity Evap Delta T* 100) /Unit Capacity
2. If above value is more than the Max Effective Full Capacity dT listed in the table above for the corresponding unit capacity, it is set equal to the value in the table.
3. Effective Full Capacity Delta T with the limit applied is then multiplied by 0.35 for units with four compressors. This gives the total control band for the unit configuration and actual unit capacity.

Staging Temperatures

If the unit is configured for use without glycol:

When the LWT target is more than half the Control Band above 3.9°C (39.0°F)

- Stage Up Temperature = LWT target + (Control Band/2)
- Stage Down Temperature = LWT target – (Control Band/2)

If the LWT target is less than half the Control Band above 3.9°C (39.0°F)

- Stage Down Temperature = LWT target – (LWT target - 3.9°C)
- Stage Up temperature = LWT target + Control Band – (LWT target – 3.9°C)

If the unit is configured for use with glycol, the compressor staging temperatures are calculated as shown below:

- Stage Up Temperature = LWT target + (Control Band/2)
- Stage Down Temperature = LWT target – (Control Band/2)

The Start up and Shutdown temperatures are referenced from the Control Band:

- Start Up Temperature = Stage Up Temperature + Start Up Delta set point
- Shutdown Temperature = Stage Down Temperature – Shutdown Delta set point

Unit Enable

Enabling and disabling the chiller is accomplished using setpoints and inputs to the chiller. The unit switch, remote switch input, and Unit Enable Set Point all are required to be 'on' for the unit to be enabled when the control source is set to 'local.' The same is true if the control source is set to 'network,' with the additional requirement that the building automation system (BAS) Enable set point must be 'on'. The BAS should enable the chiller only when there is a demand for cooling.

Unit is enabled according to the following table:

Unit Switch	Control Source Set Point	Remote Switch Input	Unit Enable Set Point	BAS Enable Set Point	Unit Enable
Off					Off
			Off		Off
		Off			Off
On	Local	On	On		On
	Network			Off	Off
On	Network	On	On	On	On

Unit Mode Selection

The operating mode of the unit is determined by setpoints and inputs to the chiller. The Available Modes Set Point determines what modes of operation can be used. This set point also determines whether the unit is configured for glycol use. The Control Source Set Point determines where a command to change modes will come from. A digital input switches between cool mode and ice mode if they are available and the control source is set to 'local.' The BAS mode request switches between cool mode and ice mode if they are both available and the control source is set to 'network.'

The Available Modes Set Point should only be changeable when the unit switch is off. This is to avoid changing modes of operation inadvertently while the chiller is running.

Unit Mode is set according to the following table:

Control Source Set Point	Mode Input	BAS Request	Available Modes Set Point	Unit Mode
			Cool	Cool
			Cool w/Glycol	Cool
Local	Off		Cool/Ice w/Glycol	Cool
Local	On		Cool/Ice w/Glycol	Ice
Network		Cool	Cool/Ice w/Glycol	Cool
Network		Ice	Cool/Ice w/Glycol	Ice
			Ice w/Glycol	Ice
			Test	Test

Glycol Configuration

If the Available Modes Set Point is set to an option 'w/Glycol,' then glycol operation should be enabled for the unit. Glycol operation should only be disabled when the Available Modes Set Point is set to 'Cool.'

Unit Controller Operation

Unit States

The unit will always be in one of three states:

Off – Unit is not enabled to run
Auto – Unit is enabled to run
Pumpdown – Unit is doing a normal shutdown

Transitions between these states are shown in the following diagram.

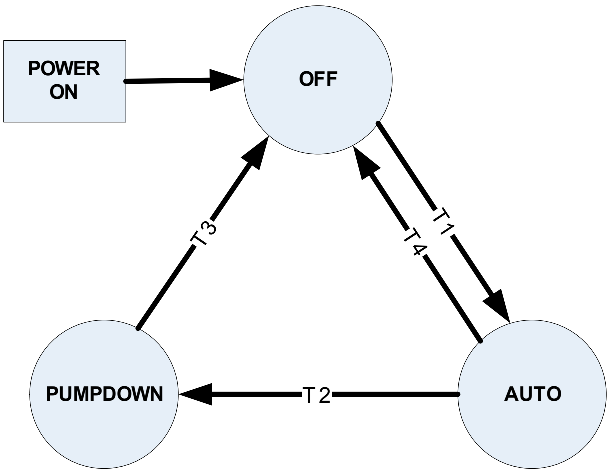


Diagram explanation on following page.

T1 - Off to Auto

All of the following are required:

- Unit Enable = On
- No Unit Alarm
- A circuit is enabled to start
- If Unit Mode = Ice then Ice Delay not active

T2 - Auto to Pumpdown

Any of the following are required:

- Unit Enable = Off and Unit Switch is closed
- Unit Mode = Ice AND LWT target is reached
- Unit Pumpdown Alarm active

T3 - Pumpdown to Off

Any of the following are required:

- Unit rapid stop alarm active
- All circuits complete pumpdown
- Unit Switch open

T4 - Auto to Off

Any of the following are required:

- Unit rapid stop alarm active
- No circuit enabled and no compressors running
- Unit Switch open

Power Up Start Delay

After powering up the unit, the motor protectors may not be engaged for up to 150 seconds. Therefore, after the control is powered up, no compressor can start for 150 seconds. In addition, the motor protect inputs are ignored during this time so as to avoid tripping a false alarm.

Ice Mode Start Delay

An adjustable start to start ice delay timer will limit the frequency with which the chiller may start in Ice mode. The timer starts when the first compressor starts while the unit is in ice mode. While this timer is active, the chiller cannot restart in Ice mode. The time delay is adjustable via the Ice Time Delay set point.

The ice delay timer may be manually cleared to force a restart in ice mode. A set point specifically for clearing the ice mode delay is available. In addition, cycling the power to the controller should clear the ice delay timer.

Low Ambient Lockout

When the OAT drops below the low ambient lockout set point and the OAT sensor fault is not active, low ambient lockout is triggered. The unit should go into the pumpdown state if any circuits are running. If no circuits are running the unit should go into the off state. This condition should clear when OAT rises to the lockout set point plus 2.5°C (4.5°F).

Unit Status

The displayed unit status should be determined by the conditions in the following table:

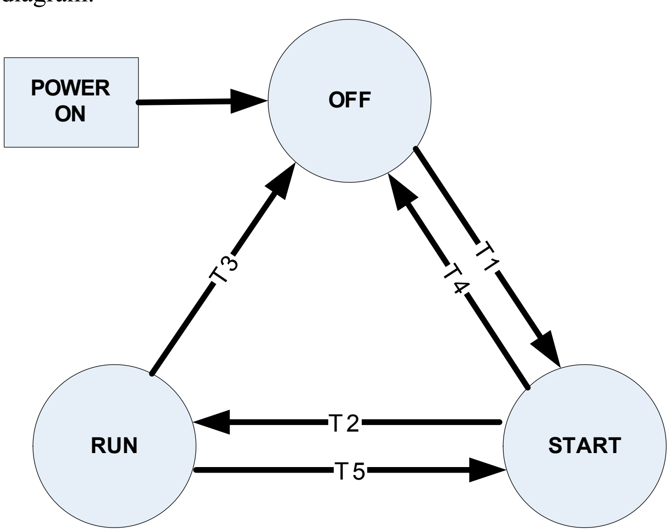
#	Status	Conditions
1	Auto	Unit State = Auto
2	Auto: Motor Prot Delay	Unit State = Auto and MP start up delay is active
3	Off: Ice Mode Timer	Unit State = Off, Unit Mode = Ice, and Ice Delay = Active
4	Off: OAT Lockout	Unit State = Off and Low OAT Lockout is active
5	Off: All Cir Disabled	Unit State = Off and both circuits unavailable
6	Off: Unit Alarm	Unit State = Off and Unit Alarm active
7	Off: Keypad Disable	Unit State = Off and Unit Enable Set Point = Disable
8	Off: Remote Switch	Unit State = Off and Remote Switch is open
9	Off: BAS Disable	Unit State = Off, Control Source = Network, and BAS Enable = false
10	Off: Unit Switch	Unit State = Off and Unit Switch = Disable
11	Off: Test Mode	Unit State = Off and Unit Mode = Test
12	Auto: Wait for load	Unit State = Auto, no circuits running, and LWT is less than the active set point + startup delta
13	Auto: Evap Recirc	Unit State = Auto and Evaporator State = Start
14	Auto: Wait for flow	Unit State = Auto, Evaporator State = Start, and Flow Switch is open
15	Auto: Pumpdown	Unit State = Pumpdown
16	Auto: Max Pulldown	Unit State = Auto, max pulldown rate has been met or exceeded
17	Auto: Unit Cap Limit	Unit State = Auto, unit capacity limit has been met or exceeded
18	Auto: High Ambient Limit	Unit State = Auto and high ambient capacity limit is active
19	Config Changed, Reboot Required	A configuration change requiring a reboot has occurred but controller has not been rebooted yet.

Evaporator Pump Control

For control of the evaporator pumps, three evaporator pump control states should be used:

Off - No pump on.
Start – Pump is on, water loop is being recirculated.
Run – Pump is on, water loop has been recirculated and circuits can start if needed.

Transitions between these states are shown in the following diagram.



T1 – Off to Start
Requires <u>any</u> of the following

- Unit state = Auto
- LWT is less than the Evap Freeze set point – 0.6°C (1.1°F) and LWT sensor fault isn’t active

T2 – Start to Run
Requires the following

- Flow ok for time longer than evaporator recirculate time set point

T3 – Run to Off
Requires <u>all</u> of the following

- Unit state is Off
- LWT is higher than the Evap Freeze set point or LWT sensor fault is active

T4 – Start to Off
Requires <u>all</u> of the following

- Unit state is Off
- LWT is higher than the Evap Freeze set point or LWT sensor fault is active

T5 – Run to Start
This transition should occur per the requirements for pump staging and evaporator flow loss alarm.

Unit Controller Operation

Freeze Protection

To protect the evaporator from freezing, the evaporator pump will start if all of the following are true:

- LWT equal to or less than the Evap Freeze set point for at least three seconds
- LWT sensor fault isn't active
- manual reset flow loss alarm is not active

Freeze protection will end when any of the following are true:

- LWT is at least 1.11°C (2°F) above the Evap Freeze set point and pump has been in run state for at least as long as the evaporator recirculation time
- LWT sensor fault is active
- manual reset flow loss alarm is active

Pump Selection

The pump output used will be determined by the Evap Pump Control set point. This setting allows the following configurations:

- #1 only – Pump 1 will always be used
- #2 only – Pump 2 will always be used
- Auto – The primary pump is the one with the least run hours, the other is used as a backup
- #1 Primary – Pump 1 is used normally, with pump 2 as a backup
- #2 Primary – Pump 2 is used normally, with pump 1 as a backup

Primary/Standby Pump Staging

The pump designated as primary will start first. If the evaporator state is start for a time greater than the recirculate timeout set point and there is no flow, then the primary pump will shut off and the standby pump will start. When the evaporator is in the run state, if flow is lost for more than half of the flow proof set point value, the primary pump will shut off and the standby pump will start. Once the standby pump is started, the flow loss alarm logic will apply if flow cannot be established in the evaporator start state, or if flow is lost in the evaporator run state.

Auto Control

If auto pump control is selected, the primary/standby logic above is still used. When the evaporator is not in the run state, the run hours of the pumps will be compared. The pump with the least hours will be designated as the primary at this time.

LWT Target

The LWT Target varies based on settings and inputs.

The base LWT Target is selected as follows:

Control Source Set Point	Mode Input	BAS Request	Available Modes Set Point	Base LWT Target
Local	OFF		COOL	Cool Set Point 1
Local	ON		COOL	Cool Set Point 2
Network			COOL	BAS Cool Set Point
Local	OFF		COOL w/Glycol	Cool Set Point 1
Local	ON		COOL w/Glycol	Cool Set Point 2
Network			COOL w/Glycol	BAS Cool Set Point
Local	OFF		COOL/ICE w/Glycol	Cool Set Point 1
Local	ON		COOL/ICE w/Glycol	Ice Set Point
Network		COOL	COOL/ICE w/Glycol	BAS Cool Set Point
Network		ICE	COOL/ICE w/Glycol	BAS Ice Set Point
Local			ICE w/Glycol	Ice Set Point
Network			ICE w/Glycol	BAS Ice Set Point

Leaving Water Temperature (LWT) Reset

The base LWT target may be reset if the unit is in Cool mode and LWT reset is enabled via the set point.

The reset amount is adjusted based on the 4 to 20 mA reset input. Reset is 0° if the reset signal is less than or equal to 4 mA. Reset is 5.56°C (10.0°F) if the reset signal equals or exceeds 20 mA. The amount of reset will vary linearly between these extremes if the reset signal is between 4 mA and 20 mA.

When the reset amount increases, the Active LWT Target is changed at a rate of 0.1°C every 10 seconds. When the active reset decreases, the Active LWT Target is changed all at once.

After the reset is applied, the LWT target can never exceed a value of 15.56°C (60°F).

Unit Capacity Control

Unit capacity control will be performed as described in this section. All unit capacity limits described in following sections must be applied as described.

Compressor Staging in Cool Mode

The first compressor on the unit should be started when evaporator LWT is higher than the Startup Temperature.

Additional compressors can be started when Evaporator LWT is higher than the Stage Up Temperature and the Stage Up Delay is not active.

When multiple compressors are running, one should shut down if evaporator LWT is lower than the Stage Down Temperature and the Stage Down Delay is not active.

All running compressors should shut down when the evaporator LWT is lower than the Shut Down Temperature.

Stage Up Delay

A minimum amount of time, defined by the Stage Up Delay set point, should pass between increases in the capacity stage. This delay should only apply when at least one compressor is running. If the first compressor starts and quickly shuts off for some reason, another compressor may start without this minimum time passing.

Stage Down Delay

A minimum amount of time, defined by the Stage Down Delay set point, should pass between decreases in the capacity stage. This delay should not apply when the LWT drops below the Shut Down Temperature (unit should immediately shut down).

Compressor Staging in Ice Mode

The first compressor on the unit should be started when evaporator LWT is higher than the Startup Temperature.

Additional compressors should be started as quickly as possible with respect to the Stage Up Delay.

The unit should shut down when evaporator LWT is less than the LWT target.

Stage Up Delay

A fixed stage up delay of one minute between compressor starts should be used in this mode.

Staging Sequence

This section defines which compressor is the next one to start or stop. In general, compressors with fewer starts will normally start first, and compressors with more run hours will normally stop first.

If possible circuits will be balanced in stage. If a circuit is unavailable for any reason, the other circuit shall be allowed to stage all compressors on. When staging down, one compressor on each circuit shall be left on until each circuit has only one compressor running.

Next To Start

If both circuits have an equal number of compressors running or a circuit has no compressors available to start:

- the available compressor with the least starts will be next to start
- if starts are equal, the one with the least run hours will be next to start
- if run hours are equal, the lowest numbered one will be next to start

If the circuits have an unequal number of compressors running, the next compressor to start will be on the circuit with the least compressors running if it has at least one compressor available to start. Within that circuit:

- the available compressor with the least starts will be next to start
- if starts are equal, the one with the least run hours will be next to start
- if run hours are equal, the lowest numbered one will be next to start

Next to Stop

If both circuits have an equal number of compressors running:

- the running compressor with the most run hours will be next to stop
- if run hours are equal, the one with the least starts will be next to stop
- if starts are equal, the lowest numbered one will be next to stop

If the circuits have an unequal number of compressors running, the next compressor to stop will be on the circuit with the most compressors running. Within that circuit:

- the running compressor with the most run hours will be next to stop
- if run hours are equal, the one with the least starts will be next to stop
- if starts are equal, the lowest numbered one will be next to stop

Unit Capacity Overrides

Unit capacity limits can be used to limit total unit capacity in Cool mode only. Multiple limits may be active at any time, and the lowest limit is always used in the unit capacity control.

Demand Limit

The maximum unit capacity can be limited by a 4 to 20 mA signal on the Demand Limit analog input. This function is only enabled if the Demand Limit set point is set to ON. The maximum unit capacity stage is determined as shown in the following tables:

Table 35: Four Compressors:

Demand Limit Signal (%)	Demand Limit (mA)	Stage Limit
Limit ≥ 75%	Limit ≥ 16 mA	1
75% > Limit ≥ 50%	16 mA > Limit ≥ 12 mA	2
50% > Limit ≥ 25%	12 mA > Limit ≥ 8 mA	3
25% > Limit	8 mA > Limit	4

Network Limit

The maximum unit capacity can be limited by a network signal. This function is only enabled if the control source is set to network. The maximum unit capacity stage is based on the network limit value received from the BAS and is determined as shown in the following tables:

Table 36: Four compressors:

Network Limit	Stage Limit
Limit ≥ 100%	4
100% > Limit ≥ 75%	3
75% > Limit ≥ 50%	2
50% > Limit	1

Maximum LWT Pulldown Rate

The maximum drop rate for the leaving water temperature shall be limited by the Maximum Pulldown Rate set point only when the unit mode is Cool.

If the rate exceeds the set point, no more compressors can be started until the pulldown rate is less than the set point. Running compressors will not be stopped as a result of exceeding the maximum pulldown rate.

High Ambient Limit

On units configured with single point power connections, the maximum load amps could be exceeded at high ambient temperatures. If all compressors are running on circuit 1 or all but one compressor on circuit 1, power connection is single point, and the outdoor air temperature OAT is greater than 46.6°C (115.9°F), circuit 2 is limited to running all but one compressor. This limit will allow the unit to operate at higher temperatures than 46.6°C (115.9°F) up to 51.6°C (125°F).

When the limit is active, the unit is allowed to run all but one compressor. So it will inhibit the unit fromloading if all but one compressor is on, and it will shut down a compressor if all compressors are running.

RapidRestore® Option

RapidRestore is an option that can be added to AGZ chillers. The general purpose of the option is to allow the capability to restart more quickly and to load faster than normal.

Enabling

The RapidRestore option shall be enabled via the RapidRestore set point. Doing so will require the following to be true:

- RapidRestore module is present at address 22
- DI1 on the RapidRestore module has a signal

If the DI1 input loses the signal or the RapidRestore module is not longer communicating, then the option will be disabled in the chiller.

Operation Following Power Cycle

The chiller will enter RapidRestore upon powering up when the following conditions are met:

- RapidRestore is enabled
- Power failure lasts less than the value of the Max Power Failure Time set point
- Power failure lasts at least one second (shorter power loss may result in unpredictable operation)
- Unit is enabled

When RapidRestore is triggered, the time value used for the evaporator recirculation time will be limited to 110 seconds or less. The evaporator recirculation time set point will not be changed. Only the value used in the evaporator state logic will be limited, and only if the set point exceeds the 110 second limit.

This action will ensure that the chiller is ready to start after the motor protection module delay has expired.

Time to Start

The manufacturer requires a minimum two minute delay after power on until a compressor should be started, which is to ensure proper operation of the motor protection modules. Unit controller boot time is about 10 seconds, so a delay of 110 seconds will start upon completing boot up. After this delay, the two minute manufacturer requirement will be satisfied.

After the 110 second delay, the first circuit to start will enter the preopen state, which takes five seconds. The end result is that the first compressor should start approximately 125 seconds after power is restored to the chiller.

Current software has a delay of 150 seconds after bootup is complete before the first circuit can start. The software will be changed to use the 110 second delay discussed above only when the chiller is performing the RapidRestore operation.

Fast Loading

Fast loading will be performed when the following conditions are met after the unit power up:

- Chiller enters RapidRestore operation
- Current LWT > Start Up Temperature

For reference, Start Up Temperature is Stage Up Temperature + Start Up Delta T. Stage Up Temperature is calculated based on the Full Capacity Evaporator Delta T set point and the number of compressors on the chiller.

Fast loading should end if any of the following conditions occur:

- LWT < Stage Up Temperature
- Unit capacity = 100%
- All circuits become disabled for any reason
- Unit becomes disabled for any reason
- 10 minutes have passed since unit powered up

When fast loading ends, the RapidRestore operation is considered complete.

Capacity Changes

Normally the delay between compressors staging on is determined by the Stage Up Delay setting. That setting defaults to 240 seconds and has a range of 120 to 480 seconds. During fast loading, a delay of 60 seconds between compressor starts within a circuit should be used. In addition, a delay of 30 seconds between compressor starts on different circuits should be used.

This change during RapidRestore operation will allow for a faster time to full capacity while maintaining stable operation within each circuit. Assuming both circuits are able to run, the effective unit stage up delay will be 30 to 35 seconds, so it will load about four times faster during RapidRestore than the fastest it possibly can during normal operation.

Max Pulldown Rate

Max pulldown rate will be ignored during fast loading to avoid having it interfere in the chiller getting loaded up as fast as possible.

Backup Chiller Operation

If DI2 on the RapidRestore module has a signal and the unit has RapidRestore enabled, then the chiller is considered a ‘backup chiller’. When a ‘backup chiller’ is enabled, it will use an evaporator recirculation time of 13 seconds regardless of what the evaporator recirculation time set point is. Then, fast loading will be used as outlined above in the fast loading section.

This backup chiller sequence is safe for the unit if it has had power applied for the minimum time stated in the operation manual. Since this sequence does not have to wait on the compressor motor protection module delay, the unit can achieve full capacity even faster than during a power loss scenario.

Compressor Starts Per Hour

Since the compressor cycle timers are not maintained through power cycling, a limitation on the number of starts per hour will be added. Each compressor will be allowed six starts in an hour.

If a compressor start is being delayed due to this limitation, it can be cleared by using the existing Clear Cycle Timers setting.

The following charts show the approximate best case scenario for start time and loading time with the RapidRestore operation.

Figure 16: Four Compressor Units – Power Lost and Restored

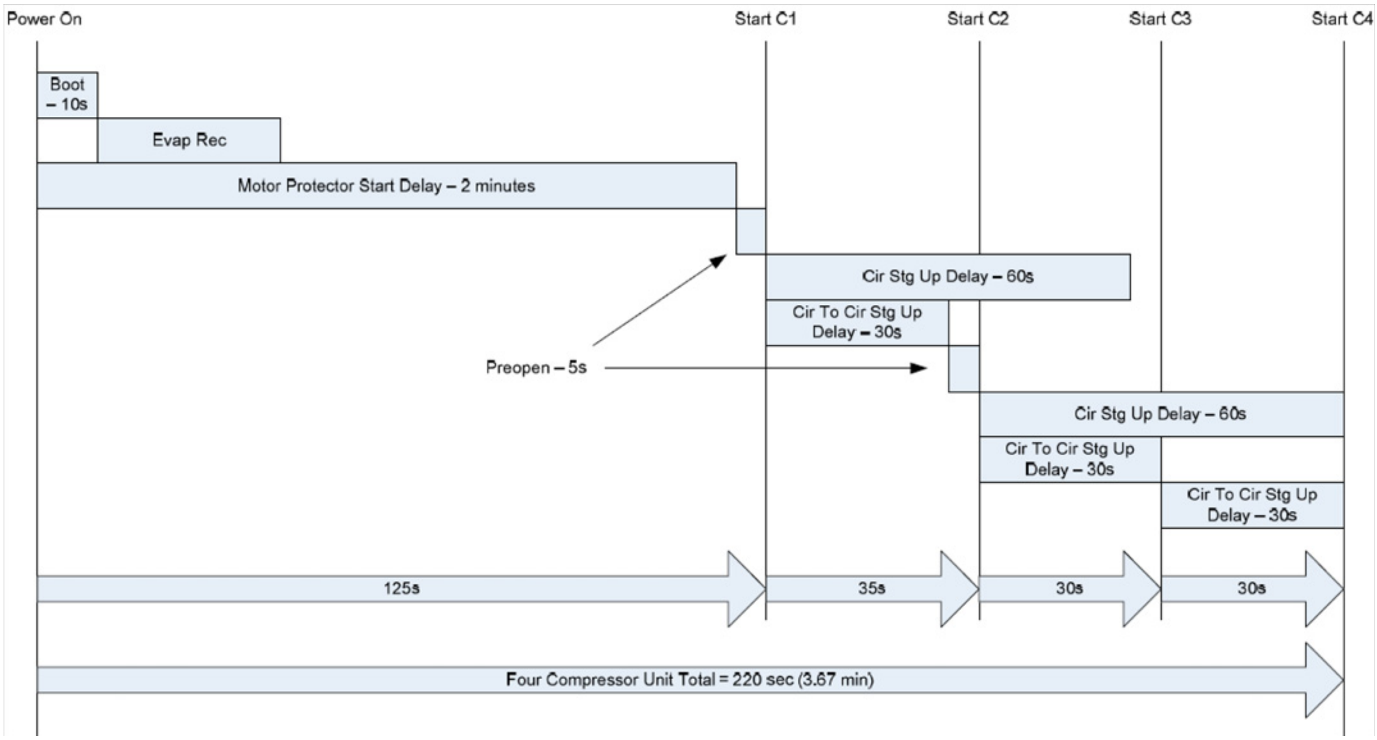
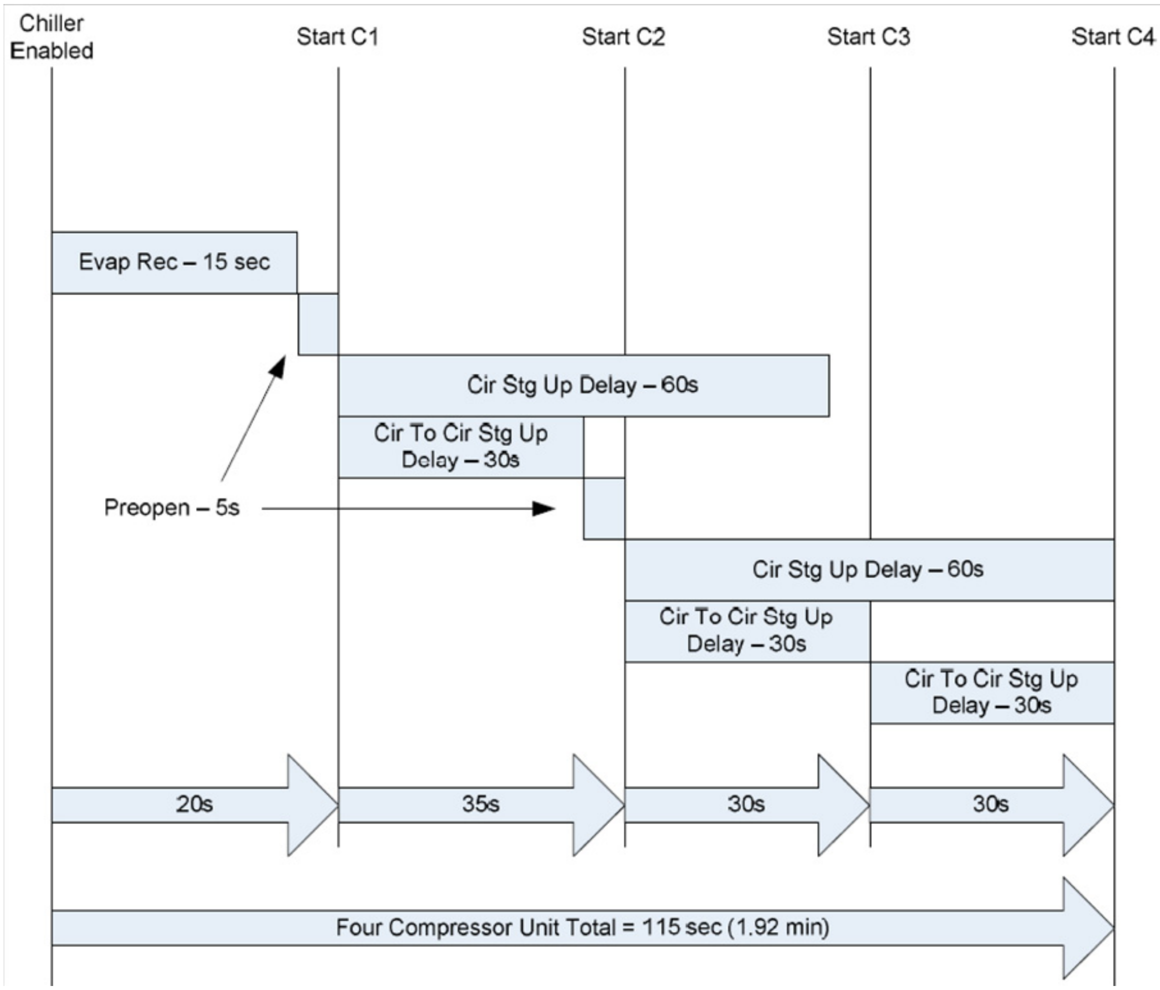


Figure 17: Four Compressor Units - Backup Chiller, Constant Power



Circuit Functions

Definitions

Refrigerant Saturated Temperature

Refrigerant saturated temperature shall be calculated from the pressure sensor readings for each circuit.

Evaporator Approach

The evaporator approach shall be calculated for each circuit. The equation is as follows:

Evaporator Approach = LWT – Evaporator Saturated Temperature

Condenser Approach

The condenser approach shall be calculated for each circuit. The equation is as follows:

Condenser Approach = Condenser Saturated Temperature - OAT

Suction Superheat

Suction superheat shall be calculated for each circuit using the following equation:

Suction superheat = Suction Temperature – Evaporator Saturated Temperature

Pumpdown Pressure

The pressure to which a circuit will pumpdown is based on the Low Evaporator Pressure Unload set point. The equation is as follows:

Pumpdown pressure = Low Evap Pressure Unload set point – 103KPA (15 PSI)

Circuit Control Logic

Circuit Enabling

A circuit should be enabled to start if the following conditions are true:

- Circuit switch is closed
- No circuit alarms are active
- Circuit Mode set point is set to Enable
- At least one compressor is enabled to start (according to enable setpoints)

Compressor Availability

A compressor is considered available to start if all the following are true:

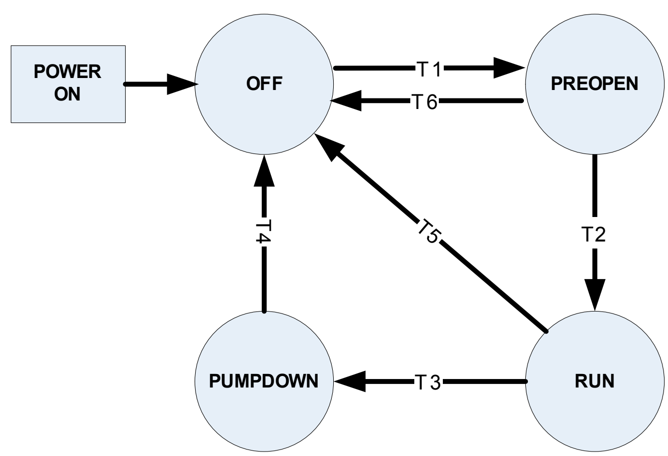
The corresponding circuit is enabled

- The corresponding circuit is not in pumpdown
- No cycle timers are active for the compressor
- No limit events are active for the corresponding circuit
- The compressor is enabled via the enable setpoints
- The compressor is not already running

Circuit States

The circuit will always be in one of four states:
Off – Circuit is not running
Preopen – Circuit is preparing to start
Run – Circuit is running
Pumpdown – Circuit is doing a normal shutdown

Transitions between these states are shown in the following diagram.



T1 – Off to Preopen

- No compressors are running and any compressor on circuit is commanded to start (see unit capacity control)

T2 – Preopen to Run

- 5 seconds has passed

T3 – Run to Pumpdown

Any of the following are required:

- Last compressor on circuit is commanded to stop
- Unit State = Pumpdown
- Circuit switch is open
- Circuit mode is disable
- Circuit Pumpdown alarm is active

T4 – Pumpdown to Off

Any of the following are required:

- Evaporator Pressure < Pumpdown Pressure Value
- Unit State = Off
- Circuit Rapid Stop alarm is active

T5 – Run to Off

Any of the following are required:

- Unit State = Off
- Circuit Rapid Stop alarm is active
- A low ambient start attempt failed

T6 – Preopen to Off

Any of the following are required:

- Unit State = Off
- Unit State = Pumpdown
- Circuit switch is open
- Circuit mode is disable
- Circuit Rapid Stop alarm is active
- Circuit Pumpdown alarm is active

Pumpdown Procedure

Pumpdown is performed as follows:

- If multiple compressors are running, shut off the appropriate compressors based on sequencing logic and leave only one running
- Turn off hot gas output and liquid line output
- Keep running until evaporator pressure reaches the pumpdown pressure, then stop compressor
- If evaporator pressure does not reach pumpdown pressure within two minutes, stop compressor

Low Ambient Starts

A low OAT start is initiated if the condenser refrigerant saturated temperature is less than 29.5°C (85.1° F) when the first compressor starts. Once the compressor starts the circuit is in a low OAT start state for a time equal to the Low OAT Start Time set point. During Low OAT Starts, the freezestat logic for the low evaporator pressure alarm as well as the low evaporator pressure hold and unload alarms are disabled. The absolute limit for low evaporator pressure is enforced and the low evaporator pressure alarm should trigger if the evaporator pressure drops below that limit.

When the Low OAT Start Timer has expired, if the evaporator pressure is greater than or equal to the Low Evaporator Pressure Unload set point, the start is considered successful and normal alarm and event logic is reinstated. If the evaporator pressure is less than the Low Evaporator Pressure Unload set point when the Low OAT Start Timer expires, the start is unsuccessful and the compressor will shutdown.

Multiple Low Ambient Start attempts are allowed. On the third failed Low Ambient Start attempt, the Restart Alarm is triggered and the circuit will not attempt to restart until the Restart alarm has been cleared.

The restart counter should be reset when either a startup is successful, the Low OAT Restart alarm is triggered, or the unit time clock shows that a new day has started.

Circuit Status

The displayed circuit status should be determined by the conditions in the following table:

#	Status	Conditions
1	Off:Ready	Circuit is ready to start when needed.
2	Off:Cycle Timers	Circuit is off and cannot start due to active cycle timer on all compressors.
3	Off:All Comp Disable	Circuit is off and cannot start due to all compressors being disabled.
4	Off:Keypad Disable	Circuit is off and cannot start due to circuit enable set point.
5	Off:Circuit Switch	Circuit is off and circuit switch is off.
6	Off:Alarm	Circuit is off and cannot start due to active circuit alarm.
7	Off:Test Mode	Circuit is in test mode.
8	Preopen	Circuit is in preopen state.
9	Run:Pumpdown	Circuit is in pumpdown state.
10	Run:Normal	Circuit is in run state and running normally.
11	Run:Evap Press Low	Circuit is running and cannot load due to low evaporator pressure.
12	Run:Cond Press High	Circuit is running and cannot load due to high condenser pressure.
13	Run:High OAT Limit	Circuit is running and cannot add more compressors due to the high ambient limit on unit capacity. Applies only to circuit 2.

Compressor Control

Compressors should run only when the circuit is in a run or pumpdown state. They should not be running when the circuit is in any other state.

Starting a Compressor

A compressor should start if it receives a start command from the unit capacity control logic.

Stopping a Compressor

A compressor should be turned off if any of the following occur:

- Unit capacity control logic commands it off
- An unload alarm occurs and the sequencing requires this compressor to be next off
- Circuit state is pumpdown and sequencing requires this compressor to be next off

Cycle Timers

A minimum time between starts of the compressor and a minimum time between shutdown and start of the compressor shall be enforced. The time values are determined by the Start-start Timer and Stop-start Timer setpoints.

These cycle timers should not be enforced through cycling of power to the chiller. This means that if power is cycled, the cycle timers should not be active.

These timers may be cleared via a setting on the controller.

Condenser Fan Control

Condenser fan control should stage fans as needed any time compressors are running on the circuit. All running fans should turn off when the circuit goes to the off state.

Fan Staging

Fan staging shall accommodate anywhere from 2 to 7 fans on a circuit using up to 5 outputs for control. The total number of fans on shall be adjusted with changes of one fan at a time. The tables below show the outputs energized for each stage.

2 Through 4 Fans	
Stage	**Fan Outputs On**
1	1
2	1,2
3	1,2,3
4	1,2,3,4

Condenser Target

A condenser target should be selected from the setpoints based on the number of compressors on the unit and the number of compressors running. Each stage of capacity on a circuit will use a different condensing target set point.

A minimum condenser target should be enforced. This minimum will be calculated based on the evaporator LWT. As the LWT varies from 7.2°C (45°F) to 32.2°C (90°F), the minimum condenser target will vary from 23.9°C (75°F) to 48.9°C (120°F).

Staging Up

The first fan should turn on when the saturated condenser temperature exceeds the condenser target. After this, the four stage up dead bands shall be used. Stages one through four

should use their respective dead bands. Stages five through six should all use the Stage Up Dead Band 4.

When the saturated condenser temperature is above the target + the active deadband, a stage up error is accumulated.

Stage Up Error Step = Saturated Condenser Temperature – (Target + Stage Up dead band)

The Stage Up Error Step is added to Stage Up Accumulator once every 5 seconds, only if the Saturated Condenser Refrigerant Temperature is not falling. When Stage Up Error Accumulator is greater than 11°C (19.8°F) another stage is added.

When a stage up occurs or the saturated condenser temperature falls back within the stage up dead band the Stage Up Accumulator is reset to zero.

Staging Down

Four stage down dead bands shall be used. Stages one through four should use their respective dead bands. Stages five through seven should all use Stage Down Dead Band 4.

When the saturated condenser refrigerant temperature is below the target – the active deadband, a stage down error is accumulated.

Stage Down Error Step = (Target - Stage Down dead band) - Saturated Condenser Temperature

The Stage Down Error Step is added to Stage Down Accumulator once every 5 seconds. When the Stage Down Error Accumulator is greater than 2.8°C (5°F) another stage of condenser fans is removed.

When a stage down occurs or the saturated temperature rises back within the Stage Down dead band the Stage Down Error Accumulator is reset to zero.

VFD

Condenser pressure trim control is accomplished using an optional VFD on the first fan. This VFD control should vary the fan speed to drive the saturated condenser temperature to a target value. The target value is normally the same as the saturated condenser temperature target.

The speed should be controlled between the minimum and maximum speed setpoints.

VFD State

The VFD speed signal should always be 0 when the fan stage is 0.

When the fan stage is greater than 0, the VFD speed signal should be enabled and control the speed as needed.

Stage Up Compensation

In order to create a smoother transition when another fan is staged on, the VFD compensates by slowing down initially. This is accomplished by adding the new fan stage up deadband to the VFD target. The higher target causes the VFD logic to decrease fan speed. Then, every 2 seconds, 0.1°C (0.18°F) is subtracted from the VFD target until it is equal to the saturated condenser temperature target set point.

High IPLV Mode

When the High IPLV Mode setting is 'On' and one compressor is running on the unit, the condenser target setting for the running circuit may be overridden. In this case, rather than use the condenser target setting for 33% or 50% (depending on total number of compressors), the condenser target will be forced to 21.11°C (70°F).

In addition, when high IPLV mode is active the calculation for the minimum allowed condenser target (based on LWT) will be changed. The minimum value will be changed from 23.9°C (75°F) to 21.11°C (70°F). No other changes to the operation are made when High IPLV mode is on.

Special Operation For MicroChannel Coil

For units configured with MicroChannel condenser coils, the fan staging is the same as for a standard coil except there are two additional conditions which may cause the fan stage to increase:

- If the second compressor on a circuit starts, one of the two condenser fans is running, and the condenser saturated temperature is higher than the target for 100% capacity, then the second condenser fan will start immediately.
- If one of the two condenser fans is running and the saturated condenser temperature exceeds 56.67°C (134°F) then the second condenser fan will start immediately.

Both of these additions are in place to deal with temporarily higher condenser pressure resulting from the lower volume of the MicroChannel coils. Note that this software version supports E vintage chillers only up through the AGZ070E at this time, so all E vintage models supported have four compressors and four fans.

EXV Control

Auto Control

Any time the circuit is not in the run state, the EXV position should be 0. The EXV control state should display that the EXV state is closed when this is the case.

When the circuit is in the Pre-open state, the EXV should go into superheat control.

While a circuit is in the run state, the EXV should go into superheat control. While in superheat control, the EXV controls suction superheat. The suction superheat target is set by a set point. A PID function will be used to control the superheat to the target value. The EXV response should be faster when the SSH is lower than 1.67°C (3°F) or higher than the SSH Target + 1.67°C (3°F) .

The EXV should also prevent the evaporator pressure from exceeding the Maximum Evaporator Pressure set point. This is done by using another PID function to control evaporator pressure to the maximum evaporator pressure.

The EXV position should be lesser position output from the two PID functions.

Position Commands

In order to improve the reliability of the EXV positioning, the position commands that are issued to the stepper driver are limited in two ways:

First, position commands are filtered so that the minimum change in position is 0.3%. Changes of less than this are ignored. This avoids unnecessary movement of the EXV and lowers the chances of losing steps as a result.

Second, the position commands are issued once per program cycle with a maximum change of 0.7% each time. This allows the stepper to move the valve to the commanded position before the next position command is issued. Issuing commands in this way may also lower the chances of losing steps.

EXV Position Range

The following table shows the EXV range based on the number of compressors running and the total number of fans on the unit.

		Compressors Running		
		1	2	3
Num Fans = 4	EXV Min	8%	8%	-
	EXV Max	50%	100%	-

The expansion valve maximum position may be increased if after two minutes both the suction superheat is greater than 7.2°C (13°F) and the expansion valve has been within 5% of its current maximum position. The maximum should increase at a rate of 0.1% every six seconds up to a total of an additional 10%. This offset to the maximum position should be reset when the EXV is no longer in the Superheat Control state or a compressor on the circuit stages.

Manual Control

The EXV position can be set manually. Manual control can only be selected when the circuit is in the run state. At any other time, the EXV control set point is forced to auto.

When EXV control is set to manual, the EXV position is equal to the manual EXV position setting. If set to manual when the circuit state transitions from run to another state, the control setting is automatically set back to auto. When in manual control, the EXV control state displayed should reflect that it is manual control.

Liquid Line Solenoid Valve

The liquid line solenoid output should be on when the circuit state is either Pre-open or Run. This output should be off at all other times.

Hot Gas Bypass Solenoid Valve

This output shall be on when circuit state is Run and one compressor on the circuit is running. The output should be off at all other times.

Capacity Overrides – Limits of Operation

The following conditions shall override automatic capacity control as described. These overrides keep the circuit from entering a condition in which it is not designed to run.

Low Evaporator Pressure

If the Low Evaporator Pressure Hold or Low Evaporator Pressure Unload alarms are triggered, the circuit capacity may be limited or reduced. See the Circuit Events section for details on triggering, reset, and actions taken.

High Condenser Pressure

If the High Condenser Pressure Unload alarm is triggered, the circuit capacity may be limited or reduced. See the Circuit Events section for details on triggering, reset, and actions taken.

Situations may arise that require some action from the chiller or that should be logged for future reference. Alarms are classified in the following sections using the Fault/Problem/Warning scheme.

When any Unit Fault Alarm is active, the alarm digital output should be turned on continuously. If both circuits have a Circuit Fault Alarm active, the alarm digital output should be turned on continuously. If no Unit Fault Alarm is active and only one circuit has a Circuit Fault Alarm is active, the alarm digital output should alternate five seconds on and five seconds off continuously.

All alarms appear in the active alarm list while active. All alarms are added to the alarm log when triggered and when cleared. Entries in the log representing the occurrence of an alarm will be preceded by '+' while entries representing the clearing of an alarm will be preceded by '-'.

Unit Fault Alarms

PVM/GFP Fault

Trigger: Power Configuration = Single Point and PVM/GFP Input #1 is open.

Action Taken: Rapid stop all circuits

Reset: Auto reset when input is closed for at least 5 seconds or if Power Configuration = Multi Point.

Evaporator Flow Loss

Trigger:

1: Evaporator Pump State = Run AND Evaporator Flow Digital Input = No Flow for time > Flow Proof Set Point AND at least one compressor running

2: Evaporator Pump State = Start for time greater than Recirc Timeout Set Point and all pumps have been tried and Evaporator Flow Digital Input = No Flow

Action Taken: Rapid stop all circuits

Reset:

This alarm can be cleared at any time manually via the keypad or via the BAS clear alarm command.

If active via trigger condition 1:

When the alarm occurs due to this trigger, it can auto reset the first two times each day with the third occurrence being manual reset.

For the auto reset occurrences, the alarm will reset automatically when the evaporator state is Run again. This means the alarm stays active while the unit waits for flow, then it goes through the recirculation process after flow is detected. Once the recirculation is complete, the evaporator goes to the Run state which will clear the alarm. After three occurrences, the count of occurrences is reset and the cycle starts over if the manual reset flow loss alarm is cleared.

If active via trigger condition 2:

If the flow loss alarm has occurred due to this trigger, it is always a manual reset alarm.

Evaporator Water Freeze Protect

Trigger: Evaporator LWT drops below evaporator freeze protect set point and LWT sensor fault is not active.

Action Taken: Rapid stop all circuits

Reset: This alarm can be cleared manually via the keypad, but only if the alarm trigger conditions no longer exist.

Evaporator LWT Sensor Fault

Trigger: Sensor shorted or open

Action Taken: Normal stop all circuits

Reset: This alarm can be cleared manually via the keypad or BAS command, but only if the sensor is back in range.

Outdoor Air Temperature Sensor Fault

Trigger: Sensor shorted or open

Action Taken: Normal stop of all circuits.

Reset: This alarm can be cleared manually via the keypad or via BAS command if the sensor is back in range.

External Alarm

Trigger: External Alarm/Event opens for at least 5 seconds and external fault input is configured as an alarm.

Action Taken: Rapid stop of all circuits.

Reset: Auto clear when digital input is closed.

Compressor Module 1 Comm Failure

Trigger: Communication with the I/O extension module has failed.

Action Taken: Rapid stop of circuit 1.

Reset: This alarm can be cleared manually via the keypad or BAS command when communication between main controller and the extension module is working for 5 seconds.

Compressor Module 2 Comm Failure

Trigger: Communication with I/O extension module failed.

Action Taken: Rapid stop of circuit 2.

Reset: This alarm can be cleared manually via the keypad or BAS command when communication between main controller and the extension module is working for 5 seconds.

EXV Module 1 Comm Failure

Trigger: Expansion Valve Type = Electronic and **c**ommunication with the I/O extension module has failed.

Action Taken: Rapid stop of circuit 1.

Reset: This alarm can be cleared manually via the keypad or BAS command when communication between main controller and the extension module is working for 5 seconds or Expansion Valve Type = Thermal.

EXV Module 2 Comm Failure

Trigger: Expansion Valve Type = Electronic and **c**ommunication with the I/O extension module has failed.

Action Taken: Rapid stop of circuit 2.

Reset: This alarm can be cleared manually via the keypad or BAS command when communication between main controller and the extension module is working for 5 seconds or Expansion Valve Type = Thermal.

Unit Problem Alarms

Evaporator Pump #1 Failure

Trigger: Unit is configured with primary and backup pumps, pump #1 is running, and the pump control logic switches to pump #2.
Action Taken: Backup pump is used.

Reset: This alarm can be cleared manually via the keypad or BAS command.

Evaporator Pump #2 Failure

Trigger: Unit is configured with primary and backup pumps, pump #2 is running, and the pump control logic switches to pump #1.

Action Taken: Backup pump is used.

Reset: This alarm can be cleared manually via the keypad or BAS command.

Unit Warning Alarms

External Event

Trigger: External Alarm/Event input is open for at least 5 seconds and external fault is configured as an event.

Action Taken: None.

Reset: Auto clear when digital input is closed.

Bad Demand Limit Input

Trigger: Demand limit input out of range and demand limit is enabled. For this alarm out of range is considered to be a signal less than 3mA or more than 21mA.

Action Taken: Cannot use demand limit function.

Reset: Auto clear when demand limit disabled or demand limit input back in range for 5 seconds.

Bad LWT Reset Input

Trigger: LWT reset input out of range and LWT reset is enabled. For this alarm out of range is considered to be a signal less than 3mA or more than 21mA.

Action Taken: Cannot use LWT reset function.

Reset: Auto clear when LWT reset is disabled or LWT reset input back in range for 5 seconds.

Evaporator EWT Sensor Fault

Trigger: Sensor shorted or open

Action Taken: None.

Reset: Auto clear when the sensor is back in range.

Circuit Fault Alarms

PVM/GFP Fault

Trigger: Power Configuration = Multi Point and circuit PVM/GFP input is open.

Action Taken: Rapid stop circuit.

Reset: Auto reset when input is closed for at least 5 seconds or if Power Configuration = Single Point.

Low Evaporator Pressure

Trigger:

This alarm should trigger when Freeze time is exceeded, Low Ambient Start is not active, and Circuit State = Run. It should also trigger if Evaporator Press < 137.9 KPA (20 psi) and Circuit State = Run for longer than 1 second.

Freezestat logic allows the circuit to run for varying times at low pressures. The lower the pressure, the shorter the time the compressor can run. This time is calculated as follows:

Freeze error = Low Evaporator Pressure Unload – Evaporator Pressure

Freeze time =

For units equipped with 10 or more condenser fans (shell and tube type evaporator):
80 – freeze error, limited to a range of 40 to 80 seconds
For all other configurations (plate to plate type evaporator):
60 – freeze error, limited to a range of 20 to 60 seconds

When the evaporator pressure goes below the Low Evaporator Pressure Unload set point, a timer starts. If this timer exceeds the freeze time, then a freezestat trip occurs. If the evaporator pressure rises to the unload set point or higher, and the freeze time has not been exceeded, the timer will reset.

The alarm cannot trigger if the evaporator pressure sensor fault is active.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the keypad if the evaporator pressure is above 137.9 KPA (20 PSI).

High Condenser Pressure

Trigger: Condenser Pressure > High Condenser Pressure set point .

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the controller keypad.

Mechanical High Pressure Switch

Trigger: Mechanical High Pressure switch input is open, Motor Protection input is closed, and power up start delay is not active.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the controller keypad if the MHP switch input is closed.

Motor Protection Fault

Trigger: Motor Protection input is open and power up start delay is not active.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the controller keypad if the input is closed.

Low OAT Restart Fault

Trigger: Circuit has failed three low OAT start attempts.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the keypad or via BAS command.

No Pressure Change After Start

Trigger: After start of compressor, at least a 7 KPA (1 PSI) drop in evaporator pressure OR 35 KPA (5.1 PSI) increase in condenser pressure has not occurred after 30 seconds. The actual alarm will not be triggered until the second occurrence.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the keypad or via BAS command.

Evaporator Pressure Sensor Fault

Trigger: Sensor shorted or open.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the keypad or BAS command, but only if the sensor is back in range.

Condenser Pressure Sensor Fault

Trigger: Sensor shorted or open.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the keypad or BAS command, but only if the sensor is back in range.

Suction Temperature Sensor Fault

Trigger: Sensor shorted or open and Expansion Valve Type = Electronic.

Action Taken: Normal shutdown of circuit.

Reset: This alarm can be cleared manually via the keypad or BAS command, but only if the sensor is back in range.

Events

Situations may arise that require some action from the chiller or that should be logged for future reference, but aren't severe enough to track as alarms. These events are stored in a log separate from alarms. This log shows the time and date of the latest occurrence, the count of occurrences for the current day, and the count of occurrences for each of the previous 7 days.

Unit Events

Unit Power Restore

Trigger: Unit controller is powered up.

Action Taken: None

Reset: None

Circuit Events

Low Evaporator Pressure - Hold

Trigger:
This event is triggered if all of the following are true:

- circuit state = Run
- evaporator pressure <= Low Evaporator Pressure - Hold set point
- circuit is not currently in a low OAT start
- it has been at least 30 seconds since a compressor has started on the circuit.

Action Taken: Inhibit starting of additional compressors on the circuit.

Reset: While still running, the event will be reset if evaporator pressure > Low Evaporator Pressure Hold SP + 90 KPA(13 PSI). The event is also reset if the circuit is no longer in the run state.

Low Evaporator Pressure - Unload

Trigger:
This event is triggered if all of the following are true:

- circuit state = Run
- more than one compressor is running on the circuit
- evaporator pressure <= Low Evaporator Pressure - Unload set point for a time greater than half of the current freezestat time
- circuit is not currently in a low OAT start
- it has been at least 30 seconds since a compressor has started on the circuit.

On units equipped with 6 compressors, electronic expansion valves, and 10 or more fans, when each compressors starts, there should be a 2 minute window during which the evaporator pressure must drop an additional 27 KPA (3.9 PSI) to trigger the alarm. After this 2 minute window, the trigger point should return to normal.

Action Taken: Stage off one compressor on the circuit every 10 seconds, except the last one.

Reset: While still running, the event will be reset if evaporator pressure > Low Evaporator Pressure Hold SP + 90 KPA(13 PSI). The event is also reset if the circuit is no longer in the run state.

High Condenser Pressure - Unload

Trigger:
This event is triggered if all of the following are true:

- circuit state = Run
- more than one compressor is running on the circuit
- condenser pressure > High Condenser Pressure – Unload set point

Action Taken: Stage off one compressor on the circuit every 10 seconds while condenser pressure is higher than the unload set point, except the last one. Inhibit staging more compressors on until the condition resets.

Reset: While still running, the event will be reset if condenser pressure <= High Condenser Pressure Unload SP – 862 KPA(125 PSI). The event is also reset if the circuit is no longer in the run state.

Circuit Warning Alarms

Failed Pumpdown

Trigger: Circuit state = pumpdown for longer than 2 minutes.

Action Taken: Rapid stop circuit.

Reset: N/A.

Alarm Logs

NOTE: refer to Figure 18 for controller components. Press the alarm button on the controller to go to the alarm section. Three alarm sub-sections will appear. Turn the navigating wheel to highlight among them and press the wheel to select.

1. Active Alarms

When an alarm or event occurs, it appears in the active alarm list. The active alarm list holds a record of all active alarms not yet cleared and includes the date and time each occurred. When cleared, the alarm transfers to the Alarm Log that contains an alarm history with time/date stamp. A (+) before an alarm indicates that it is active, a (-) indicates a cleared alarm. The Active Alarm list is only limited by the number of alarms since any given alarm cannot appear twice.

2. Alarm Log

An alarm log stores the last 50 occurrences or resets that occur. When an alarm or event occurs, it is put into the first slot in the alarm log and all others are moved down one, dropping the last entry. The date and time the alarm occurred are stored in the alarm log.

3. Event Log

An Event Log similar to the Alarm Log stores the last 50 event occurrences. Each Event Log entry includes an event description and a time and date stamp for the event occurrence plus the count of the event occurrences on the current day and for each of the last seven days. Events do not appear in the Active Alarm list.

Clearing Alarms

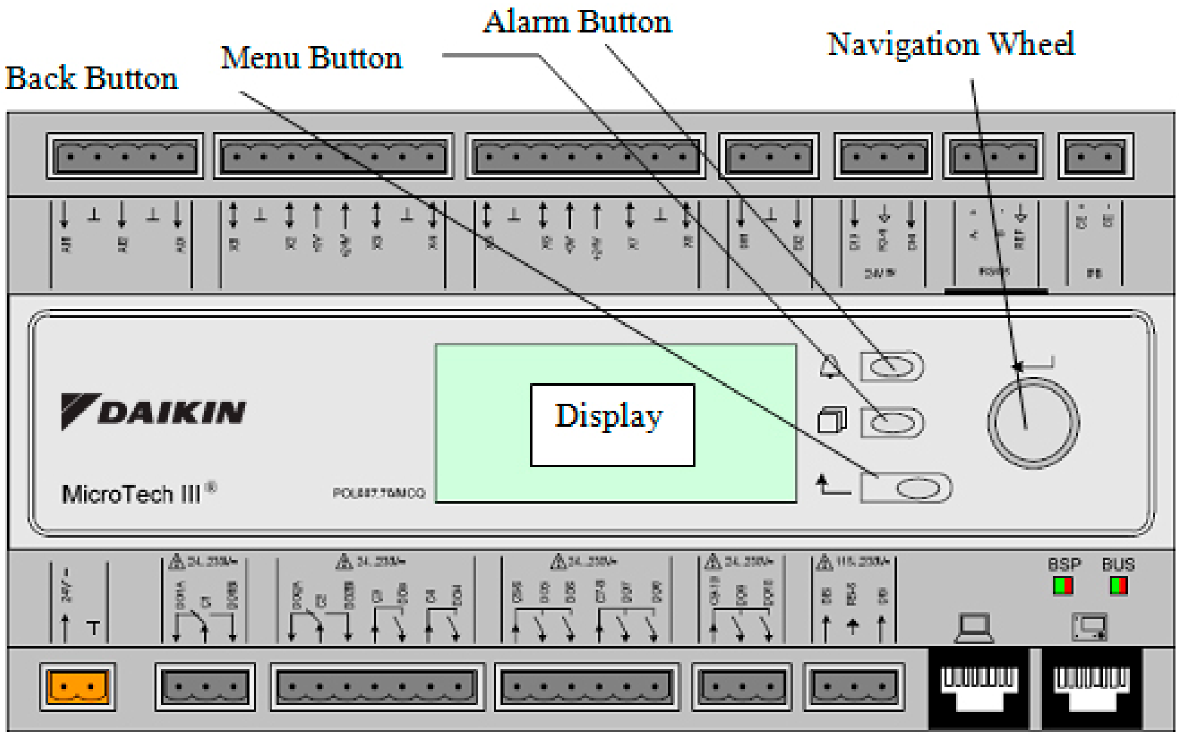
Active alarms can be cleared through the keypad/display or a BAS network. Alarms are automatically cleared when controller power is cycled. Alarms are cleared only if the conditions required to initiate the alarm no longer exist. All alarms and groups of alarms can be cleared via the keypad or network via LON using nviClearAlarms and via BACnet using the ClearAlarms object.

To use the keypad, follow the Alarm links to the Alarms screen, which will show Active Alarms and Alarm Log. Select Active Alarm and press the wheel to view the Alarm List (list of current active alarms). They are in order of occurrence with the most recent on top. The second line on the screen shows Alm Cnt (number of alarms currently active) and the status of the alarm clear function. Off indicates that the Clear function is off and the alarm is not cleared. Press the wheel to go to the edit mode. The Alm Clr (alarm clear) parameter will be highlighted with OFF showing. To clear all alarms, rotate the wheel to select ON and enter it by pressing the wheel.

An active password is not necessary to clear alarms.

If the problem(s) causing the alarm have been corrected, the alarms will be cleared, disappear from the Active Alarm list and be posted in the Alarm Log. If not corrected, the On will immediately change back to OFF and the unit will remain in the alarm condition.

Figure 18: Schematic of Unit Controller



The keypad/display consists of a 5-line by 22-character display, three buttons (keys) and a "push and roll" navigation wheel. There is an Alarm Button, Menu (Home) Button and a Back Button. The wheel is used to navigate between lines on a screen (page) and to increase and decrease changeable values when editing. Pushing the wheel acts as an Enter Button and will jump from a link to the next set of parameters.

Figure 19: Typical Screen

♦6 View/Set Unit	3
Status/Settings	>
Set Up	>
Temperature	>
Date/Time/Schedule	>

Generally, each line on the display contains a menu title, a parameter (such as a value or a setpoint), or a link (which will have an arrow in the right of the line) to a further menu.

The first line visible on each display includes the menu title and the line number to which the cursor is currently "pointing." In the above case 3, Temperature is highlighted.

The left most position of the title line includes an "up" arrow ▲ to indicate there are lines (parameters) "above" the currently displayed line; and/or a "down" arrow ▼ to indicate there are lines (parameters) "below" the currently displayed items or an "up/down" arrow ♦ to indicate there are lines "above and below" the currently displayed line. The selected line is highlighted.

Each line on a screen can contain status-only information or include changeable data fields (setpoints).

When the cursor is on a line the highlights will look like this:

If line contains a changeable value-

| Evaporator Delta T= 10.0F |

If the line contains status-only information-

| Unit Status= | Run |

Or a line in a menu may be a link to further menus. This is often referred to as a jump line, meaning pushing the navigation wheel will cause a "jump" to a new menu. An arrow (>)is displayed to the far right of the line to indicate it is a "jump" line and the entire line is highlighted when the cursor is on that line.

NOTE - Only menus and items that are applicable to the specific unit configuration are displayed.

This manual includes information relative to the operator level of parameters; data and setpoints necessary for the every day operation of the chiller. There are more extensive menus available for the use of service technicians.

Navigating

When power is applied to the control circuit, the controller screen will be active and display the Home screen, which can also be accessed by pressing the Menu Button The navigating wheel is the only navigating device necessary, although the

MENU, ALARM, and BACK buttons can provide shortcuts as explained later.

Passwords

Enter passwords from the Main Menu:

- Enter Password links to the Entry screen which is an editable screen. So pressing the wheel goes to the edit mode where the password (5321) can be entered. The first (*) will be highlighted, rotate the wheel clockwise to the first number and set it by pressing the wheel. Repeat for the remaining three numbers. The password will time out after 10 minutes and is cancelled if a new password is entered or the control powers down.

  •Not entering a password allows access to a limited number of parameters (with asterisks) as shown in Figure 22.

Figure 20: Password Menu

	Main Menu	1/3
Enter Password	>	
Unit Status		
Off: Unit Sw		
ACTIVE SETPT	44.6°F	

Figure 21: Password Entry Page

	Enter Password	1/1
Enter PW	****	

Entering an invalid password has the same effect as not entering a password.

Once a valid password has been entered, the controller allows further changes and access without requiring the user to enter a password until either the password timer expires or a different password is entered. The default value for this password timer is 10 minutes.

Navigation Mode

When the navigation wheel is turned clockwise, the cursor moves to the next line (down) on the page. When the wheel is turned counter-clockwise the cursor moves to the previous line (up) on the page. The faster the wheel is turned the faster the cursor moves. Pushing the wheel acts as an “Enter” button.

Three types of lines exist:

- Menu title, displayed in the first line as in Figure 21.
- Link (also called Jump) having an arrow (>) in the right of the line and used to link to the next menu.
- Parameters with a value or adjustable setpoint.

For example, “Time Until Restart” jumps from level 1 to level 2 and stops there.

When the Back Button is pressed the display reverts back to the previously displayed page. If the Back button is repeatedly pressed the display continues to revert one page back along the current navigation path until the “main menu” is reached.

When the Menu (Home) Button is pressed the display reverts to the “main page.”

When the Alarm Button is depressed, the Alarm Lists menu is displayed.

Edit Mode

The Editing Mode is entered by pressing the navigation wheel while the cursor is pointing to a line containing an editable field. Once in the edit mode pressing the wheel again causes the editable field to be highlighted. Turning the wheel clockwise while the editable field is highlighted causes the value to be increased. Turning the wheel counter-clockwise while the editable field is highlighted causes the value to be decreased. The faster the wheel is turned the faster the value is increased or decreased. Pressing the wheel again cause the new value to be saved and the keypad/display to leave the edit mode and return to the navigation mode.

A parameter with an “R” is read only; it is giving a value or description of a condition. An “R/W“ indicates a read and/or write opportunity; a value can be read or changed (providing the proper password has been entered).

Example 1: Check Status, for example -is the unit being controlled locally or by an external network? We are looking for the Unit Control Source Since this a unit status parameter, start at Main Menu and select View/Set Unit and press the wheel to jump to the next set of menus. There will be an arrow at the right side of the box which indicates a jump to the next level is required. Press the wheel to execute the jump.

You will arrive at the Status/ Settings link. There is an arrow indicating that this line is a link to a further menu. Press the wheel again to jump to the next menu, Unit Status/Settings.

Rotate the wheel to scroll down to Control Source and read the result.

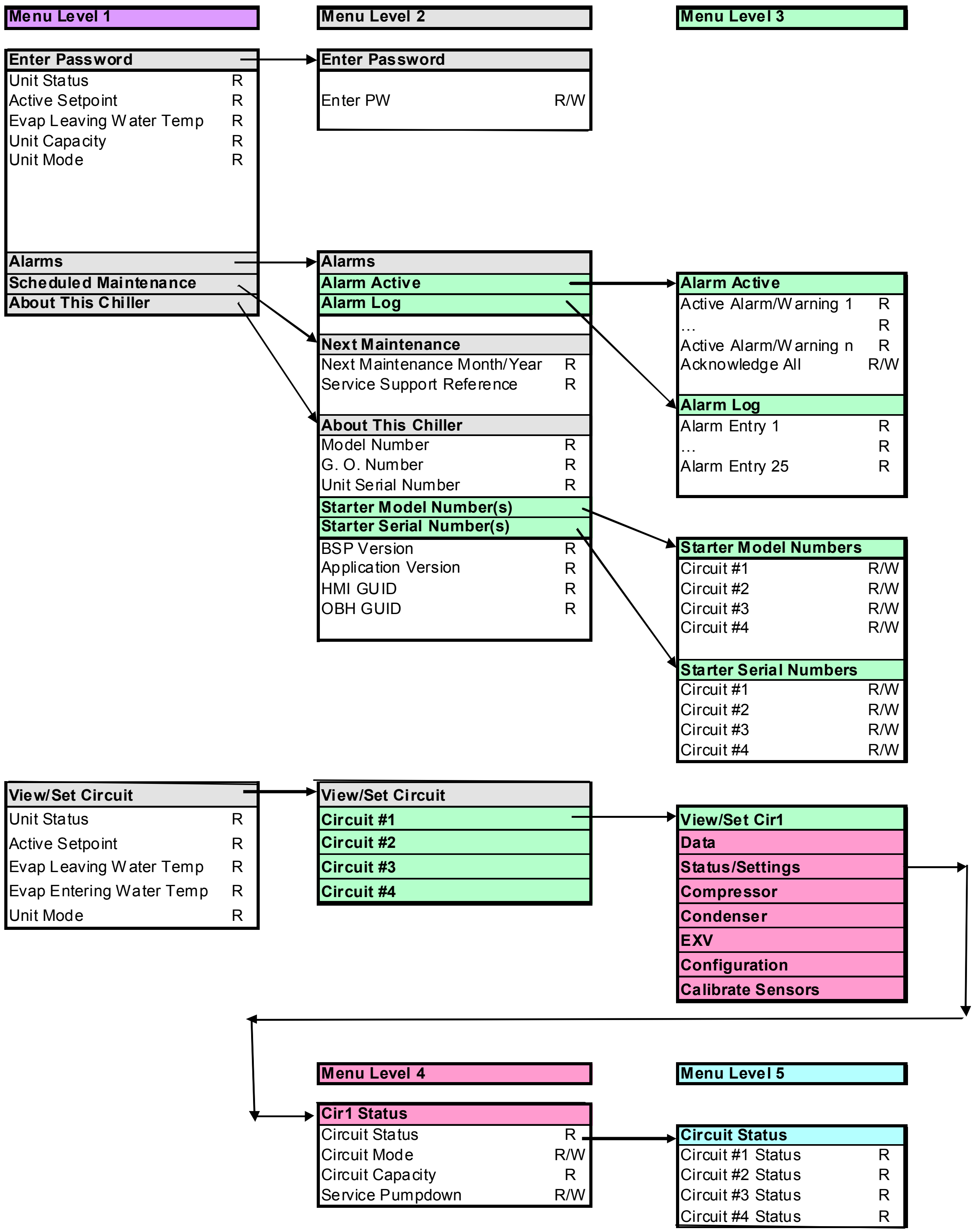
Example 2: Change a Setpoint, the chilled water setpoint for example. This parameter is designated as Cool LWT 1 setpoint and is a unit parameter. From the Main Menu select View/Set Unit. The arrow indicated that this is link to a further menu.

Press the wheel and jump to the next menu View/Set Unit and use the wheel to scroll down to Temperatures. This again has an arrow and is a link to a further menu. Press the wheel and jump to the Temperatures menu, which contains temperatures values and setpoints. The first line is Evap LWT, rotate wheel until Cool LWT 1 is highlighted. Press the wheel to enter edit mode. Rotate wheel until new setpoint is reached, then press wheel to accept the new value and exit edit mode.

Example 3: Clear an Alarm, from the Main Menu scroll down to the Alarms line. Note the arrow indicating this line is a link. Press the wheel to jump to the next menu Alarms There are two lines here; Alarm Active and Alarm Log. Alarms are cleared from the Active Alarm link. Press the wheel to jump to the next screen. With the first line highlighted, press the wheel to enter edit mode. Rotate wheel until AlmClr is set to On, then press wheel to clear the alarms.

Figure 22: Controller Keypad Navigation

Visable (w/o Password)



Optional Low Ambient Fan VFD

The optional VFD fan control is used for unit operation below 32°F (0°C) down to a minimum of -10°F (-23°C). The control looks at the saturated discharge temperature and varies the fan speed to hold the temperature (pressure) at the "target" temperature.

Low ambient air temperature control is accomplished by using the Optional Low Ambient VFD to control the speed of the first fan on each circuit. This VFD control uses a proportional integral function to drive the saturated condenser temperature to a target value by changing the fan speed. The target value is normally the same as the saturated condenser temperature target setpoint.

The fan VFD always starts when the saturated condenser temperature rises higher than the target.

What is an Inverter?

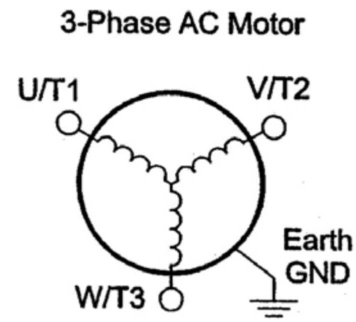
The term inverter and variable-frequency drive are related and somewhat interchangeable. An electronic motor drive, for an AC motor, controls the motor's speed by varying the frequency of the power sent to the motor.

In general, an inverter is a device that converts DC power to AC power. The figure below shows how the variable-frequency drive employs an internal inverter. The drive first converts incoming AC power to DC through a rectifier bridge, creating an internal DC bus voltage. Then the inverter circuit converts the DC back to AC again to power the motor. The special inverter can vary its output frequency and voltage according to the desired motor speed.

Inverter Output to the Motor

⚠WARNING

Avoid swapping any 2 of the 3 motor lead connections which will cause reversal of the motor direction. In applications where reversed rotation could cause equipment damage or personnel injury, be sure to verify direction of rotation before attempting full-speed operation. For safety to personnel, the motor chassis ground must be connected to the ground connection at the bottom of the inverter housing.



The AC motor must be connected only to the inverter's output terminals. The output terminals are uniquely labeled (to differentiate them from the input terminals) with the designations U/T1, V/T2, and W/T3. This corresponds to typical motor lead connection designations T1, T2, and T3. The consequence of swapping any two of the three connections is the reversal of the motor direction. This must not be done. In applications where reversed rotation could cause equipment damage or personnel injury, be sure to verify direction of rotation before attempting full-speed operation. For safety to personnel, the motor chassis ground must be connected to the ground connection at the bottom of the inverter housing.

Notice the three connections to the motor do not include one marked "Neutral" or "Return." The motor represents a balanced "Y" impedance to the inverter, so there is no need for a separate return. In other words, each of the three "Hot" connections serves also as a return for the other connections because of their phase relationship.

Do not to switch off power to the inverter *while the motor is running* (unless it is an emergency stop) to avoid equipment damage. Also, do not install or use disconnect switches in the wiring from the inverter to the motor (except thermal disconnect).

VFD Interface

The VFD controller is located in the lower left-hand corner of the unit control panel. It is used to view data including fault and alarm information. No operator intervention on this control is required for normal unit operation.

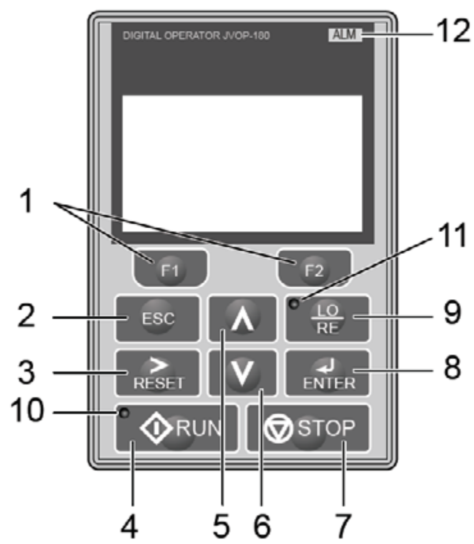


Table 37: Display Key Functions

No.	Display	Name	Function
1	F1 F2	Function Key(F1, F2)	The functions assigned to F1 and F2 vary depending on the currently displayed menu. The name of each function appears in the lower half of the display window.
2 3	ESC RESET	ESC Key RESET Key	• Returns to the previous display. • Moves the cursor one space to the left. • Pressing and holding this button will return to the Frequency Reference display.
3	ESC RESET		• Moves the cursor to the right. • Resets the drive to clear a fault situation.
4	RUN	RUN Key	Starts the drive in LOCAL mode.
5	Λ	Up Arrow Key	Scrolls up to display the next item, select parameter numbers, and increment setting values.
6	V	Down Arrow Key	Scrolls down to display the next item, select parameter numbers, and increment setting values.
7	STOP	STOP Key	Stops drive operation.
8	ENTER LO RE	ENTER Key	• Enters parameter values and settings. • Selects a menu item to move between displays
9	ENTER LO RE	LO/RE Selection Key	Switches drive control between the operator (LOCAL) and an external source (REMOTE)for the Run command and frequency reference.
10	RUN	RUN Light	Lit while the drive is operating the motor.
11	LO RE	LO/RE Light	Lit while the operator is selected to run the drive (LOCAL mode).
12	ALM	ALM LED Light	Refer to ALARM (ALM) LED Displays in ***Table 39***

Figure 23: LCD Display

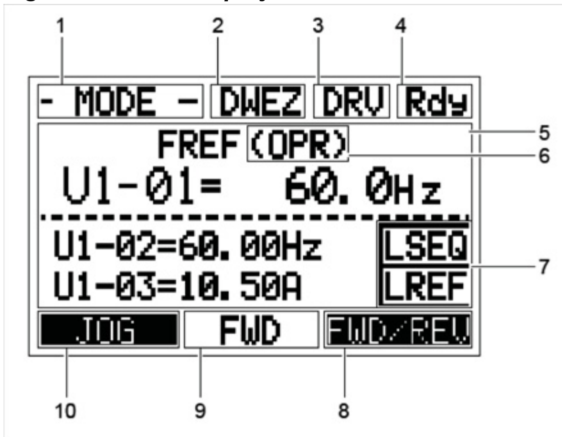


Table 38: Display Data

No	Name	Display	Content
1	Operation Mode Menus	MODE	Displayed when in Mode Selection.
		MONITR	Displayed when in Monitor Mode.
		VERIFY	Indicates the Verify Menu
		PRMSET	Displayed when in Parameter Setting Mode.
		A.TUNE	Displayed during Auto-Tuning.
		SETUP	Displayed when in Setup Mode.
2	DriveWorksEZ Function Selection	DWEZ	Displayed when DriveWorksEZ is set to enable. (A1-07 = 1 or 2)
3	Mode Display Area	DRV	Displayed when in Drive Mode.
		PRG	Displayed when in Programming Mode
4	Ready	Rdy	Indicates the drive is ready to run.
5	Data Display	—	Displays specific data and operation data.
6	FrequencyRef erence Assignment ***<1>***	OPR	Displayed when the frequency reference is assigned to the LCD Operator Option.
		AI	Displayed when the frequency reference is assigned to the Analog Input of the drive
		COM	Displayed when the frequency reference is assigned to the MEMOBUS/Modbus CommunicationInputs of the drive
		OP	Displayed when the frequency reference is assigned to an Option Unit of the drive.
		RP	Displayed when the frequency reference is assigned to the Pulse Train Input of
7	LO/RE Display ***<2>***	RSEQ	Displayed when the run command is supplied from a remote source.
		LSEQ	Displayed when the run command is supplied from the operator keypad.
		RREF	Displayed when the run command is supplied from a remote source.
		LREF	Displayed when the run command is supplied from the operator keypad
8	Function Key 1(F1)	JOG	Pressing [F1} executes the Jog function.
		HELP	Pressing [F1] displays the Help menu.
		←	Pressing [F1] scrolls the cursor to the left.
		HOME	Pressing [F1] returns to the top menu (Frequency Reference).
		ESC	Pressing [F1] returns to the previous display
9	FWD/REV	FWD	Indicates forward motor operation.
		REV	Indicates reverse motor operation.
10	Function Key 2 (F2)	FWD/REV	Pressing [F2] switches between forward and reverse
		DATA	Pressing [F2] scrolls to the next display
		→	Pressing [F2] scrolls the cursor to the right
		RESET	Pressing [F2] resets the existing drive fault error

Table 39: Alarm Content

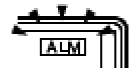
State	Content	Display
Illuminated	When the drive detects an alarm or error	
Flashing	When an alarm occurs	
	When an oPE is detected	
	When a fault or error occurs during Auto-Tuning	
Off	Normal operation (no fault or alarm)	

Table 40: LO/RE LED and RUN LED Indictors

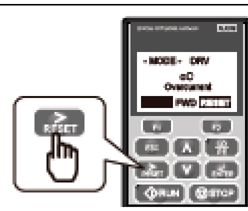
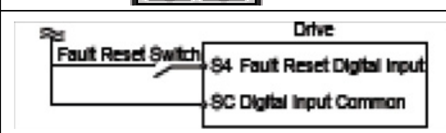
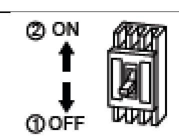
LED	Lit	Flashing Slowly	Flashing Quickly	Off
	When the operator is selected for Run command and frequency reference control (LOCAL)	--	--	When a device other than the operator is selected for Run command and frequency reference control (REMOTE)
	During run	·During deceleration to stop ·When a Run command is input and frequency reference is 0 Hz	·While the drive was set to LOCAL, a Run command was entered to the input terminals then the drive was switched to REMOTE. ·A Run command was entered via the input terminals while the drive was not in the Drive Mode. ·During deceleration when a Fast Stop command was entered. ·The drive output is shut of by the Safe Disable function. ·The STOP key was pressed while drive was running in REMOTE. ·The drive was powered up with b1-17 = 0 (default) while the Run command was active.	During stop
Examples				

Table 41: Types of Alarms, Faults, and Errors

Type	Drive Response
Faults	When the drive detects a fault: • The digital operator displays text indicating the specific fault and the ALM indicator LED remains lit until the fault is reset. • The fault interrupts drive output and the motor coasts to a stop. • Some faults allow the user to select the stopping method when the fault occurs. • Fault output terminals MA-MC will close, and MB-MC will open. The drive will remain inoperable until the fault is cleared.
Minor Faults and Alarms	When the drive detects an alarm or a minor fault: • The digital operator displays text indicating the specific alarm or minor fault, and the ALM indicator LED flashes. • The drive continues running the motor, although some alarms allow the user to select a stopping method when the alarm occurs. • A multi-function contact output set to be tripped by a minor fault (H2- □□ = 10) closes. If the output is set to be tripped by an alarm, the contact will not close. • The digital operator displays text indicating a specific alarm and the ALM indicator LED flashes. Remove the cause of the problem to reset a minor fault or alarm.
Operation Errors	An operation error occurs when parameter settings conflict or do not match hardware settings (such as with an option card).When the drive detects an operation error: • The digital operator displays text indicating the specific error. • Multi-function contact outputs do not operate. The drive will not operate the motor until the error has been reset. Correct the settings that caused the operation error to clear the error.
Tuning Errors	Tuning errors occur while performing Auto-Tuning. When the drive detects a tuning error: • The digital operator displays text indicating the specific error. • Multi-function contact outputs do not operate. • Motor coasts to stop. Remove the cause of the error and repeat the Auto-Tuning process.
Copy Function Errors	Copy Function Errors occur when using the digital operator or the USB Copy Unit to copy, read, or verify parameter settings. • The digital operator displays text indicating the specific error. • Multi-function contact outputs do not operate. Pressing any key on the digital operator will clear the fault. Investigate the cause of the problem (such as model incompatibility)and try again.

Table 42: Fault Reset Methods

NOTE: When a fault occurs, the cause of the fault must be removed and the drive must be restarted. The following tables list the various ways to restart the drive. Remove the Run command before attempting to clear a fault. If the Run command is present, the control will disregard any attempt to reset the fault.

After the Fault Occurs	Procedure	
Fix the cause of the fault, restart the drive, and reset the fault	Press  on the controller.	
Resetting via Fault Reset Digital Input S4	Close then open the fault signal digital input via terminal S4. S4 is set for “Fault Reset” as default (H1-04 = 14)	
Turn off the main power supply if the above methods do not reset the fault. Reapply power after the controller display has turned off.		

Recommended Periodic Inspection

⚠ WARNING

Electrical Shock Hazard. Before servicing or inspecting the equipment, disconnect power to the unit.The internal capacitor remains charged after power is turned off. Wait at least the amount of time specified on the drive before touching any components.

Table 43: Periodic Inspection Checklist

Inspection Area	Inspection Points	Corrective Action
General	Inspect equipment including wiring, terminals, resistors, capacitors, diode and IGBT for discoloration from overheating or deterioration.	Replace damaged components.
	Inspect for dirt or foreign particles	Use dry air to clear away.
Relays and Contactors	Inspect contactors and relays for excessive noise.	Check for over or undervoltage
	Inspect for signs of overheating such as melted or cracked insulation	Replace damaged parts.

Optional BAS Interface

The AGZ chiller controller is configured for stand-alone operation or integration with BAS through an optional communication module.

The following installation manuals for optional BAS interface modules are shipped with the chiller. They can also be found and downloaded from www.DaikinApplied.com.

- IM 966-1, BACnet® IP Communication Module
- IM 967-1, BACnet® Communication Module (MS/TP)
- IM 968-1, LONWORKS Communication Module
- IM 969-2, Modbus® Communication Module
- ED 15120, Protocol Information for MicroTech III chiller, BACnet and LONWORKS
- ED 15121, Protocol Information for MicroTech III chiller, Modbus

Start-up and Shut-down Procedures

Pre Start-up

Inspected the chiller to ensure no components became loose or damaged during shipping or installation including leak test and wiring check.

Pre-Startup Water Piping Checkout

1. Check the pump operation and vent all air from the system.
2. Circulate evaporator water, checking for proper system pressure and evaporator pressure drop. Compare the pressure drop to the evaporator water pressure drop curve.
3. Flush System and clean all water strainers before placing the chiller into service.
4. Check water treatment and proper glycol percent.

Pre-Startup Refrigerant Piping Checkout

1. Check all exposed brazed joints for evidence of leaks. Joints may have been damaged during shipping or when the unit was installed.
2. Check that all refrigerant valves are either opened or closed as required for proper operation of the chiller.
3. A thorough leak test must be done using an approved electronic leak detector. Check all valve stem packing for leaks. Replace all refrigerant valve caps and tighten.
4. Check all refrigerant lines to insure that they will not vibrate against each other or against other chiller components and are properly supported.
5. Check all connections and all refrigerant threaded connectors.
6. Look for any signs of refrigerant leaks around the condenser coils and for damage during shipping or installation.
7. Connect refrigerant service gauges to each refrigerant circuit before starting unit.

Pre-Startup Electrical Check Out

⚠ WARNING
Electrical power must be applied to the compressor crankcase heaters 8 hours before starting unit to eliminate refrigerant from the oil.

1. Open all electrical disconnects and check all power wiring connections. Start at the power block and check all connections through all components to and including the compressor terminals. These should be checked again after 3 months of operation and at least yearly thereafter.
2. Check all control wiring by pulling on the wire at the spade connections and tighten all screw connections. Check plug-in relays for proper seating and to insure retaining clips are installed.
3. Put System Switch (S1) to the Emergency Stop position.
4. Put both circuit #1 & #2 switches to the Pumpdown and Stop position.
5. Apply power to the unit. The panel Alarm Light will stay on until S1 is closed. Ignore the Alarm Light for the check out period. If you have the optional Alarm Bell, you may wish to disconnect it.
6. Check at the power block or disconnect for the proper voltage and proper voltage between phases. Check power for proper phasing using a phase sequence meter before starting unit.
7. Check for 120 Vac at the optional control transformer and at TB-2 terminal #1 and the neutral block (NB).
8. Check between TB-2 terminal #7 and NB for 120 Vac supply for transformer #2.
9. Check between TB-2 terminal #2 and NB for 120 Vac control voltage. This supplies the compressor crank case heaters.
10. Check between TB-3 terminal #17 and #27 for 24 Vac control voltage.

Start-Up

Refer to the MicroTech III Controller information on page 24 to become familiar with unit operation before starting the chiller.

There should be adequate building load (at least 50 percent of the unit full load capacity) to properly check the operation of the chiller refrigerant circuits.

Be prepared to record all operating parameters required by the "Compressorized Equipment Warranty Form". Return this information within 10 working days to Daikin Applied as instructed on the form to obtain full warranty benefits.

Start-Up Steps

- Verify chilled water flow.
- Verify remote start / stop or time clock (if installed) has requested the chiller to start.
- Set the chilled water setpoint to the required temperature. (The system water temperature must be greater than the total of the leaving water temperature setpoint plus one-half the control band plus the start-up delta-T before the MicroTech III controller will stage on cooling.)
- Set the Evap Delta T based on a percent of unit nominal flow indicated in Table 12 and the Start Delta T as a starting point. Delta-T=Tons x 24 / gpm
- Check the controller setpoints to be sure that factory defaults are appropriate.
- Put both pumpdown switches (PS1 and PS2) to the ON position.
- Put system switch (S1) to ON position.

Table 44: Pumpdown and System Switch Positions

Switch	Switch Position	
	ON	OFF
PS1, PS2, Pumpdown Switches	Circuits will operate in the normal, automatic mode	Circuit will go through the normal pumpdown cycle and shut off.
S1, System Switch	Unit will operate in the normal automatic mode	Unit will shut off immediately without pumping down (emergency stop)

Post Start-up

After the chiller has been operating for a period of time and has become stable, check the following:

- Compressor oil level. (Some scroll compressors do not have oil sight glasses).
- Refrigerant sight glass for flashing.
- Rotation of condenser fans.
- Complete the "Compressorized Equipment Warranty Form."

Shutdown

Temporary Shutdown

1. Put both circuit switches to the OFF position (Pumpdown and Stop).
2. After compressors have stopped, put System Switch (S1) to OFF (emergency stop).
3. Turn off chilled water pump. Chilled water pump to operate while compressors are pumping down.
4. To start the chiller after a temporary shutdown, follow the start-up instructions.

Extended Shutdown

1. Front seat both condenser liquid line service valves.
2. Put both circuit switches to the OFF position (Pumpdown and Stop position).
3. After the compressors have stopped, put System Switch (S1) to the OFF position (emergency stop).
4. Front seat both refrigerant circuit discharge valves (if applicable).
5. If chilled water system is not drained, maintain power to the evaporator heater to prevent freezing. Maintain heat tracing on the chilled water lines.
6. Drain evaporator and water piping to prevent freezing.
7. If electrical power to the unit is on, the compressor crankcase heaters will keep the liquid refrigerant out of the compressor oil. This will minimize start-up time when putting the unit back into service. The evaporator heater will be able to function.
8. If electrical power is off, make provisions to power the evaporator heater (if chilled water system is not drained or is filled with suitable glycol). Tag all opened electrical disconnect switches to warn against start-up before the refrigerant valves are in the correct operating position.

To start the chiller after an extended shutdown, follow the prestart-up and start-up instructions.

Hot Gas Bypass (Optional)

This option allows the system to operate at lower loads without excessive on/off compressor cycling. The hot gas bypass option is required to be on both refrigerant circuits because of the lead / lag feature of the controller.

This option allows passage of discharge gas into the evaporator inlet (between the TX valve and the evaporator) which generates a false load to supplement the actual chilled water or air handler load.

Note: The hot gas bypass valve will not generate a 100% false load.

The pressure regulating valve is factory set to begin opening at 102 psig with R-410a and can be changed by changing the pressure setting. The adjustment range is 75 to 150 psig. To raise the pressure setting, remove the cap on the bulb and turn the adjustment screw clockwise. To lower the setting, turn the screw counterclockwise. Do not force the adjustment beyond the range it is designed for as this will damage the adjustment assembly. The regulating valve opening point can be determined by slowly reducing the system load while observing the suction pressure. When the bypass valve starts to open, the refrigerant line on the evaporator side of the valve will begin to feel warm to the touch.

A solenoid valve is located ahead of the bypass valve and is controlled by the MicroTech III controller. It is active when the first stage of cooling on a circuit is active.

⚠ WARNING

The hot gas line may become hot enough to cause injury. Be careful during valve checkout.

VFD Low Ambient Control (Optional)

The optional VFD fan control is used for unit operation below 32°F (0°C) down to a minimum of -10°F (-23.3°C). The control looks at the saturated discharge temperature and varies (pressure) at the "target" temperature. This temperature is established as an input to a setpoint screen labeled "Sat Condenser Temp Target."

Compressor Communications

The communication module, installed in the 20 to 40 ton compressor electrical box, provides advanced diagnostics, protection, and communications that enhance compressor performance and reliability.

Features include motor temperature protection, scroll temperature protection, missing phase protection, reverse phase protection, low control circuit voltage protection, short cycling detection and alert, modbus communication to system controller, operational and fault history storage, and LED status display.

Operation

Warnings and Alerts

A **solid green LED** indicates the module is powered and operation is normal.

A **solid red LED** indicates an internal problem with the module.

A **flashing green LED** communicates **Warning** codes. Warning codes do not result in a trip or lockout condition.

A **flashing red LED** communicates **Alert** codes. **Alert** codes will result in a trip condition and possibly a lockout condition

Warning Codes (Flashing Green LED)

Code 1 – Loss of Communication: The module will flash the green **Warning** LED one time indicating the module has not communicated with the master controller for longer than 5 minutes.

Code 2 – Reserved For Future Use

Code 3 – Short Cycling: The module will flash the green **Warning** LED three times indicating the compressor has short cycled more than 48 times in 24 hours.

Code 4 – Open/Shorted Scroll Thermistor: The module will flash the green **Warning** LED four times indicating an open/ shorted

Alert/Lockout Codes (Flashing Red LED)

Code 1 – Motor High Temperature: The module will flash the red **Alert** LED one time indicating the motor is onerheating . A code 1 **Alert** will open the M2-M1 contacts. The **Alert** will reset after 30 minutes. Five consecutive Code 1 **Alerts** will lockout the compressor. Once the module has locked out the compressor, a power cycle or Modbus reset command will be required for the lockout to be cleared.

Code 2 – Open/Shorted Motor Thermistor: The module will flash the red **Alert** LED two times indicating the motor PTC thermistor circuit has an open/shorted thermistor chain (see **Table 2**). A Code 2 **Alert** will open the M2-M1 contacts. The **Alert** will reset after 30 minutes and the M2-M1 contacts will close if the resistance of the motor PTC circuit is back in the normal range. The module will lockout the compressor and a power cycle or Modbus reset command will be required to clear the lockout.

Code 3 – Short Cycling: The module will flash the red **Alert** LED three times indicating the compressor is locked out due to short cycling. Once locked out the compressor, a power cycle or Modbus reset command will be required to clear the lockout.

Code 4 – Scroll High Temperature: The module will flash the red **Alert** LED four times indicating the over-temperature condition. A Code 4 **Alert** will open the M2-M1 contacts.The **Alert** will reset after 30 minutes. Once the module has locked out the compressor, a power cycle or Modbus reset command will be required to clear the lockout.

Code 5 – Reserved for Future Use

Code 6 – Missing Phase: The module will flash the red **Alert** LED six times indicating a missing phase. The **Alert** will reset after 5 minutes and the module will lockout the compressor after 10 consecutive Code 6 **Alerts**. Once locked out, a power cycle or Modbus reset is required.

Code 7 – Reverse Phase: The module will flash the red **Alert** LED seven times indicating a reverse phase in two of the three compressor leads. The modules will lockout the compressor after one Code 7 **Alert**. A power cycle or Modbus reset command will be required to clear the lockout.

Code 8 – Reserved For Future Use

Code 9 – Module Low Voltage: The module will flash the red **Alert** LED nine times indicating low module voltage for more than 5 seconds. The **Alert** will reset after 5 minutes and the M2-M1 contacts will close if the T2-T1 voltage is above the reset value.

Note: If a compressor with CoreSense Communications fails in the field, the CoreSense module should remain with the failed compressor so the manufacturer’s technicians can download the CoreSense data to assist with determining the root cause of compressor failure.

Filter-Driers

For units with optional replaceable core filter driers, each refrigerant circuit is furnished with a replaceable core type filter-drier. The core assembly of the replaceable core drier consists of a filter core held tightly in the shell in a manner that allows full flow without bypass. Pressure drop across the filter drier must not exceed the following values.

PERCENT CIRCUIT LOADING (%)	DROP ACROSS PSI (KPA)
100%	10 (69)
75%	8 (55.2)
50%	5 (34.5)
25%	4 (27.6)

A condenser liquid line service valve is provided for isolating the charge in the condenser, but also serves as the point from which the liquid line can be pumped out. With the line free of refrigerant, the filter-drier core(s) can be easily replaced.

System Adjustment

To maintain peak performance at full load operation, the system superheat and liquid subcooling may require adjustment. Read the following subsections closely to determine if adjustment is required.

Liquid Line Sight Glass

The color of the moisture indicator is an indication of the dryness of the system and is extremely important when the system has been serviced. Immediately after the system has been opened for service, the element may indicate a wet condition. It is recommended that the equipment operate for approximately 12 hours to allow the system to reach equilibrium before deciding if the system requires a change of drier cores.

Bubbles in the sight glass at constant full load indicates a shortage of refrigerant, a plugged filter-drier, or a restriction in the liquid line. However, it is not unusual to see bubbles in the sight glass during changing load conditions.

Refrigerant Charging

Liquid line subcooling at the liquid shut-off valve should be between 15 and 20 degrees F at full load. If the unit is at steady full load operation and bubbles are visible in the sight glass, then check liquid subcooling.

Expansion Valve

The expansion valve's function is to keep the evaporator supplied with the proper amount of refrigerant to satisfy the load conditions.

Before adjusting superheat, check that unit charge is correct and liquid line sight glass is full with no bubbles and that the circuit is operating under stable, full load conditions.

The suction superheat for the suction leaving the evaporator is set at the factory for 10 to 12 degrees F at full load. To have

full rated unit performance, the superheat must be about 8 degrees F at 95°F outdoor ambient temperature.

Crankcase Heaters

The scroll compressors are equipped with externally mounted band heaters located at the oil sump level. The function of the heater is to keep the temperature in the crankcase high enough to prevent refrigerant from migrating to the crankcase and condensing in the oil during off-cycle.

Power must be supplied to the heaters 8 hours before starting the compressors.

Evaporator

On models AGZ-030E through 070E, the evaporator is a compact, high efficiency, dual circuit, brazed plate-to-plate type heat exchanger consisting of parallel stainless steel plates.

The evaporator is protected with an electric resistance heater and insulated with 3/4" (19mm) thick closed-cell polyurethane insulation. This combination provides freeze protection down to -20°F (-29°C) ambient air temperature. The water side working pressure of the brazed plate type of evaporator is 653 psig (4502 kPa). Evaporators are designed and constructed according to, and listed by, Underwriters Laboratories (UL).

Phase Voltage Monitor (Optional)

Factory settings are as follows:

- Trip Delay Time: 2 seconds.
- Voltage Setting: set at nameplate voltage.
- Restart Delay Time: 60 seconds.

General

On initial start-up and periodically during operation, it will be necessary to perform certain routine service checks. Among these are checking the liquid line sight glasses, taking condensing and suction pressure readings, and checking to see that the unit has normal superheat and subcooling readings. A recommended maintenance schedule is located at the end of this section.

Compressor Maintenance

The scroll compressors are fully hermetic and require no maintenance other than checking oil level.

Lubrication

No routine lubrication is required on AGZ units. The fan motor bearings are permanently lubricated and no further lubrication is required. Excessive fan motor bearing noise is an indication of a potential bearing failure.

POE type oil is used for compressor lubrication.

> ⚠ **WARNING**
>
> POE oil must be handled carefully using proper protective equipment (gloves, eye protection, etc.) The oil must not come in contact with certain polymers (e.g. PVC), as it may absorb moisture from this material. Also, do not use oil or refrigerant additives in the system.

Further details are listed in the Unit Service section starting on page 69.

Electrical Terminals

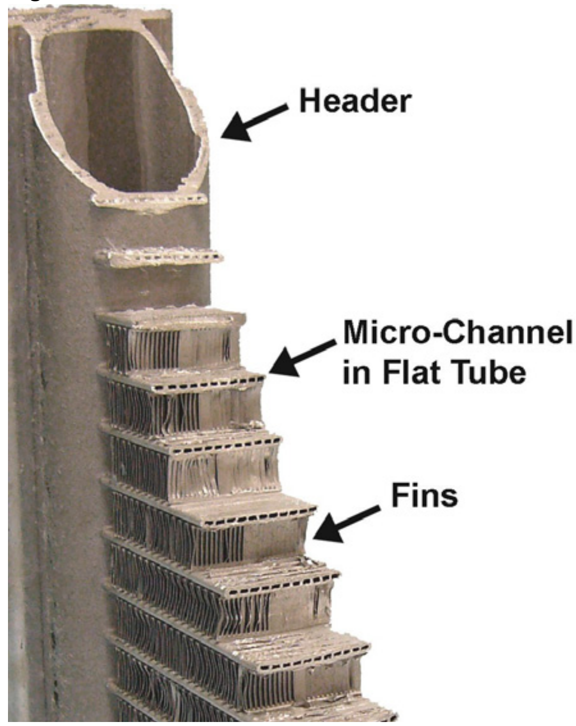
> ⚠ **DANGER**
>
> Electric shock hazard. Turn off all power before continuing with following service.

All-Aluminum Condenser Coils

The condenser coils are an all-aluminum design including the connections, micro-channels, fins (an oven brazing process brazes the fins to the micro-channel flat tube), and headers (Figure 24), which eliminates the possibility of corrosion normally found between dissimilar metals of standard coils.

During the condensing process, refrigerant in the coil passes through the micro-channel flat tubes, resulting in higher efficiency heat transfer from the refrigerant to the airstream. In the unlikely occurence of a coil leak, contact Daikin Applied to receive a replacement coil module.

Figure 24: Micro-Channel Coil Cross Section



Connecting the Condenser Coil to Copper Tubing

Figure 25 shows the aluminum condenser coil connection to the copper tubing in the unit. Because of the low melting point of aluminum (1220°F compared to 1984°F for copper), this brazed joint is performed with a low temperature brazing process.

> ⚠ **CAUTION**
>
> Potential equipment damage. If a standard copper brazing process is performed at this joint, the process will damage the aluminum connection. If a condenser coil ever needs to be replaced, the copper aluminum joint repair should be done with a ProBraze™ repair kit manufactured by OmniTechnologies Corporation. A non-corrosive flux must also be used. The brazing temperature should be between 850°F–900°F. If a coil needs replacing, contact Daikin Applied for a coil and copper connection assembly.

Figure 25: Aluminum/Copper Connection

Cleaning Micro-Channel Aluminum Coils

Maintenance consists primarily of the routine removal of dirt and debris from the outside surface of the fins and repairing any fin damage.

Cleaning ElectroFin® Coated Coils

The following cleaning procedures are recommended as part of the routine maintenance activities for ElectroFin Coated Coils. Documented routine cleaning of ElectroFin Coated Coils is required to maintain warranty coverage. The cleaning procedure can be downloaded from the ElectroFin web site www.luvata.com/electrofin, click on *Procedures for Cleaning*.

⚠WARNING

Prior to cleaning the unit, turn off and lock out the main power switch to the unit and open all access panels.

Remove Surface Loaded Fibers

Surface loaded fibers or dirt should be removed prior to water rinse to prevent further restriction of airflow. If unable to back wash the side of the coil opposite that of the coils entering air side, then surface loaded fibers or dirt should be removed with a vacuum cleaner. If a vacuum cleaner is not available, a soft non-metallic bristle brush may be used. In either case, the tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges bent over) if the tool is applied across the fins.

Note: Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

Periodic Clean Water Rinse

A monthly clean water rinse is recommended for coils that are applied in coastal or industrial environments to help to remove chlorides, dirt and debris. An elevated water temperature (not to exceed 130ºF) will reduce surface tension, increasing the ability to remove chlorides and dirt. Pressure washer PSI must not exceed 900 psig and the nozzel should remain at leat 1 foot from the coil to avoid damaging fin edges.

Routine Quarterly Cleaning of ElectroFin Coated Coil Surfaces

Quarterly cleaning is essential to extend the life of an ElectroFin Coated Coil and is required to maintain warranty coverage. Coil cleaning shall be part of the unit's regularly scheduled maintenance procedures. Failure to clean an ElectroFin Coated Coil will void the warranty and may result in reduced efficiency and durability in the environment.

For routine quarterly cleaning, first clean the coil with the below approved coil cleaner (see approved products list in Table 45). After cleaning the coils with the approved cleaning agent, use the approved chloride remover (under the Recommended Chloride Remover section) to remove soluble salts and revitalize the unit.

Recommended Coil Cleaner

The following cleaning agent, assuming it is used in accordance with the manufacturer's directions on the container for proper mixing and cleaning, has been approved for use on ElectroFin Coated Coils to remove mold, mildew, dust, soot, greasy residue, lint and other particulate:

Table 45: ElectroFin Coated Coil Recommended Cleaning Agents

Cleaning Agent	Reseller	Part Number
Enviro-Coil Concentrate	Hydro-Balance Corp P.O. Box 730 Prosper, TX 75078 800-527-5166	H-EC01
Enviro-Coil Concentrate	Home Depot	H-EC01
Chloride Remover	Chlor*Rid Int'l, Inc. P.O. Box 908 Chandler, AZ 85244 800-422-3217	Chlor*Rid DTS

CHLOR*RID DTS™ should be used to remove soluble salts from the ElectroFin Coated Coil, but the directions must be followed closely. This product is not intended for use as a degreaser. Any grease or oil film should first be removed with the approved cleaning agent.

1. Remove Barrier - Soluble salts adhere themselves to the substrate. For the effective use of this product, the product must be able to come in contact with the salts. These salts may be beneath any soils, grease or dirt; therefore, these barriers must be removed prior to application of this product. As in all surface preparation, the best work yields the best results.
2. Apply CHLOR*RID DTS - Apply CHLOR*RID DTS directly onto the substrate. Sufficient product must be applied uniformly across the substrate to thoroughly wet

out surface with no areas missed. This may be accomplished by use of a pump-up sprayer or conventional spray gun. The method does not matter, as long as the entire area to be cleaned is wetted. After the substrate has been thoroughly wetted, the salts will be soluble and is now only necessary to rinse them off.

3 Rinse - It is highly recommended that a hose be used as a pressure washer will damage the fins. The water to be used for the rinse is recommended to be of potable quality, though a lesser quality of water may be used if a small amount of CHLOR*RID DTS is added. Check with CHLOR*RID International, Inc. for recommendations on lesser quality rinse water.

Cautions

Harsh Chemical and Acid Cleaners

Harsh chemicals, household bleach or acid cleaners should not be used to clean outdoor or indoor ElectroFin Coated Coils. These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion and attack the ElectroFin coating. If there is dirt below the surface of the coil, use the recommended coil cleaners as described above.

High Velocity Water or Compressed Air

High velocity water from a pressure washer or compressed air should only be used at a very low pressure to prevent fin and/ or coil damages. The force of the water or air jet may bend the fin edges and increase airside pressure drop. Reduced unit performance or nuisance unit shutdowns may occur.

Optional High Ambient Control Panel

Consists of exhaust fan with rain hood, two inlet screens with filters, necessary controls and wiring to allow operation to 125°F (52°C). The option can be factory or field installed as a kit.

- It must be supplied on units operating at ambient temperatures of 105°F (40.6°C) and above.
- It is automatically included on units with fan VFD (low ambient option).
- Check inlet filters periodically and clean as required. Verify that the fan is operational.

Liquid Line Sight Glass

The refrigerant sight glasses should be observed periodically (a weekly observation should be adequate). A clear glass of liquid indicates that there is subcooled refrigerant charge in the system. Bubbling refrigerant in the sight glass, during stable run conditions, indicates that the system can be short of refrigerant charge. Refrigerant gas flashing in the sight glass could also indicate an excessive pressure drop in the liquid line, possibly due to a clogged filter-drier or a restriction elsewhere in the liquid line.

See Table 22, Filter-Drier Pressure Drop on page 78 for maximum allowable pressure drops. If subcooling is low, add charge to clear the sight glass. If subcooling is normal (15 to 20 degrees F) and flashing is visible in the sight glass, check the pressure drop across the filter-drier. Subcooling should be checked at full load with 70°F (21.1°C) ambient temperature, stable conditions, and all fans running.

An element inside the sight glass indicates the moisture condition corresponding to a given element color. If the sight glass does not indicate a dry condition after about 12 hours of operation, the circuit should be pumped down and the filter-drier changed or verify moisture content by performing an acid test on the compressor oil.

Unit Maintenance

Planned Maintenance Schedule

OPERATION	WEEKLY	MONTHLY (Note 1)	ANNUAL (Note 2)
General			
Complete unit log and review (Note 3)	X		
Visually inspect unit for loose or damaged components		X	
Inspect thermal insulation for integrity			X
Clean and paint as required			X
Electrical			
Check terminals for tightness, tighten as necessary			X
Clean control panel interior			X
Visually inspect components for signs of overheating		X	
Verify compressor heater operation		X	
Test and calibrate equipment protection and operating controls			X
Megger compressor motor *			X
Refrigeration			
Leak test		X	
Check sight glasses for clear flow	X		
Check filter-drier pressure drop (see manual for spec)		X	
Perform compressor vibration test			X
Acid test oil sample			X
Condenser (air-cooled)			
Clean condenser coils (Note 4)			X
Check fan blades for tightness on shaft (Note 5)			X
Check fans for loose rivets and cracks			X
Check coil fins for damage			X

Notes:

1. Monthly operations include all weekly operations.
2. Annual (or spring start-up) operations includes all weekly and monthly operations.
3. Log readings can be taken daily for a higher level of unit observation.
4. Coil cleaning can be required more frequently in areas with a high level of airborne particles.
5. Be sure fan motors are electrically locked out.

* Never Megger motors while they are in a vacuum to avoid damage to the motor.

Unit Service

R-410A

Refrigerant Terminology

Bubble Point: The temperature/pressure where bubbles first appear when heat is added to a liquid refrigerant. Used to measure sub-cooling.

Dew Point: The temperature/pressure where droplets first appear when heat is removed from a refrigerant gas. Used to measure superheat.

Fractionalization: A change in refrigerant composition due to the tendency of the higher pressure refrigerant to leak at a faster rate, should a system have leakage from a static two-phase region.

Glide: The total difference of Dew and Bubble Point at a specific condition. Mid-Point or Mean: Measurement half way between Dew and Bubble Points.

Miscibility: The ability of a refrigerant and oil to mix and flow together.

Solubility: The effect of refrigerant on the viscosity of a lubricant.

Safety

Comparable to R-22; ANSI/ASHRAE safety group A1.

Always carry and be familiar with MSDS information for R-410a.

Store refrigerant in clean, dry area out of direct sunlight.

Never heat or store cylinders above 125° F. Note vehicle precautions!

Never tamper with cylinder valves or pressure relief valves. (Typical relief for R-410A is 525 psig).

Never refill disposable cylinders.

Verify cylinder hook-up.

Verify cylinder label and color code match. R-410A is rose/light maroon. Must be DOT approved, R-410A with 400 psig rating. Open cylinders slowly.

Avoid rough handling of cylinders and secure as appropriate. Cap when not in use.

Do not overfill recovery cylinders or overcharge units.

Check gauge calibration before every use and manifold set for leaks regularly.

Be aware of pneumatic and possible hydrostatic pressure potentials.

Never pressurize systems with oxygen or ref/air mix. R-410A, R-407C, R-134A, & R-22 are flammable with low air mix.

Wear protective clothing. Impervious gloves and splash goggles should be worn.

Avoid contact with liquid refrigerant (R-410A -60.8°F @ atms.) due to corrosion and freezing hazards.

Avoid exposure to vapors. 1000 ppm/8 hr.

Evacuate areas in cases of large releases. R-410A is heavier than air and can cause asphyxiation, narcotic and cardiac sensation effects.

Evacuate systems and break vacuum (0 psig) with nitrogen before welding or brazing.

Always ventilate work areas before using open flames. Exposure to open flames or glowing metal will form toxic hydrofluoric acid & carbonyl fluoride. No smoking!

Make sure all tools, equipment, and replacement components are rated for the refrigerant used.

POE Lubricants

⚠ WARNING

POE oil must be handled carefully using proper protective equipment (gloves, eye protection, etc.) The oil must not come in contact with certain polymers (e.g. PVC), as it may absorb moisture from this material. Also, do not use oil or refrigerant additives in the system.

POE type oil is used for compressor lubrication. This type of oil is extremely hydroscopic which means it will quickly absorb moisture if exposed to air and may form acids that can be harmful to the chiller. Avoid prolonged exposure of POE oil to the atmosphere to prevent this problem. For more details on acceptable oil types, contact your Daikin Applied service representative.

It is important that only the manufacturer's recommended oils be used. Acceptable POE oil types are:

- CPI/Lubrizol Emkarate RL32-3 MAF
- Exxon/Mobil EAL Arctic 22 CC*
- Hatcol 22CC*
- Everest 22CC*
- Copeland Ultra 32-3 MAF
- Parker Emkarate RL32-3MAF
- Virginia LE323MAF
- Nu Calgon 4314-66

Note - * These types of oils can only be used as "Top Off" oils. This is defined as adding less than 50% of the total amount of oil in the unit.

Pump the lubricant into the unit through a closed transfer system. Avoid overcharging the unit.

Use only new sealed metal containers of oil to insure quality.

Buy smaller containers to prevent waste and contamination.

Use only filter driers designed for POE and check pressure drops frequently.

Test for acid and color at least annually. Change filter driers if acid or high moisture (> 200 ppm) is indicated (< 100 ppm typical).

Evacuate to 500 microns and hold test to insure systems are dry.

Control and Alarm Settings

The software that controls the operation of the unit is factory-set for operation with R-410A taking into account that the pressure/temperature relationship differs from R-22. The software functionality is the same for either refrigerant.

Refrigerant Charging

The AGZ units have a condenser coil design with approximately 15% of the coil tubes located in a subcooler section of the coil to achieve liquid cooling to within 5°F (3°C) of the outdoor air temperature when all condenser fans are operating.

Once the subcooler is filled, extra charge will not lower the liquid temperature and does not help system capacity or efficiency.

If a unit is low on refrigerant, you must first determine the cause before attempting to recharge the unit. Locate and repair any refrigerant leaks. Soap works well to show bubbles at medium size leaks but electronic leak detectors are needed to locate small leaks.

Charging or check valves should always be used on charging hoses to limit refrigerant loss and prevent frostbite. Ball valve type recommended.

Charge to 80-85% of normal charge before starting the compressors.

Charging procedure

The units are factory-charged with R-410A. Use the following procedure if recharging in the field is necessary:

To prevent fractionalization, liquid must be charged from the refrigerant cylinder, unless charging the entire cylinder contents.

The charge can be added at any load condition between 25 to 100 percent load per circuit, but at least two fans per refrigerant circuit should be operating if possible.

Start the system and observe operation.

Trim the charge to the recommended liquid line sub-cooling (approximately 14-20 degrees F typical).

Verify the suction superheat (10 degrees F for EEVs and 10 – 12 degrees F for TXVs) at full load conditions.

Use standard charging procedures (liquid only) to top off the charge.

Check the sight glass to be sure there is no refrigerant flashing.

With outdoor temperatures above 60°F (15.6°C), all condenser fans should be operating and the liquid line temperature should be within 5°F to 10°F (2.8°C to 5.6°C) of the outdoor air temperature. At 25-50% load, the liquid line temperature should be within 5°F (2.8°C) of outdoor air temperature with all fans on. At 75-100% load the liquid line temperature should be within 10°F (5.6°C) of outdoor air temperature with all fans on.

It may be necessary to add refrigerant through the compressor suction. Because the refrigerant leaving the cylinder must be a liquid, exercise care to avoid damage to the compressor by using a flow restrictor. A sight glass can be connected between the charging hose and the compressor. It can be adjusted to have liquid leave the cylinder and vapor enter the compressor.

Overcharging of refrigerant will raise the compressor discharge pressure due to filling of the condenser tubes with excess refrigerant.

Service

With R-410A, fractionalization, if due to leaks and recharge has a minimal effect on performance or operation.

Special tools will be required due to higher refrigerant pressures with R-410A. Oil-less/hp recovery units, hp recovery cylinders (DOT approved w/525# relief), gauge manifold 30”-250 psi low/0-800 psi high, hoses w/800 psi working & 4,000 psi burst.

All filter driers and replacement components must be rated POE oils and for the refrigerant pressure (R-410A 600psig typical).

R-410A compressor internal relief is 600-650 psid.

Brazed connections only. No StayBrite or solder connections (solder should never be used with any refrigerant). K or L type refrigeration tubing only. Use nitrogen purge. Higher R-410A pressures and smaller molecule size make workmanship more critical.

R-410A must be charged from cylinder as a liquid unless entire cylinder is used. Use a Refrigerant flow restrictor if charging liquid to suction or to a system at pressure below a saturated temperature of 32° F.

EPA recovery and handling requirements for R-410A are the same as R-22.

Cooling the recovery cylinder will speed recovery and lessen stress on recovery equipment.

⚠WARNING

Service on this equipment is to be performed by qualified refrigeration personnel familiar with equipment operation, maintenance, correct servicing procedures, and the safety hazards inherent in this work. Causes for repeated tripping of equipment protection controls must be investigated and corrected.

Disconnect all power before doing any service inside the unit.

Servicing this equipment must comply with the requirements set forth by the EPA in regards to refrigerant reclamation and venting.

Filter-Driers

Replace the filter-drier any time excessive pressure drop is read across the filter-drier
and/or when bubbles occur in the sight glass with normal subcooling. The maximum recommended pressure drops across the filter-drier are shown below.

Table 22, Filter-Drier Pressure Drop

PERCENT CIRCUIT LOADING (%)	MAXIMUM RECOMMENDED PRESSUREDROP ACROSS FILTER DRIER PSIG (KPA)
100%	10 (69)
75%	8 (55.2)
50%	5 (34.5)
25%	4 (27.6)

The filter-drier should also be changed if the moisture indicating liquid line sight glass indicates excess moisture in the system.

During the first few months of operation the filter-drier replacement can be necessary if the pressure drop across the filter-drier exceeds the values listed in the paragraph above. Any residual particles from the condenser tubing, compressor and miscellaneous components are swept by the refrigerant into the liquid line and are caught by the filter-drier.

Battery

The microprocessor has a battery located behind the clear plastic bezel. It is a BR2032 with a minimum life of 2 years unpowered. It would be prudent to replace it on a 2-year cycle. There is no indication of an eminent failure.

Liquid Line Solenoid Valve

The liquid line solenoid valves that shut off refrigerant flow in the event of a power failure do not normally require any maintenance. The solenoids can, however, require replacement of the solenoid coil or of the entire valve assembly.

The solenoid coil can be checked to see that the stem is magnetized when energized by touching a screwdriver to the top of the stem. If there is no magnetization, either the coil is bad or there is no power to the coil.

The solenoid coil can be removed from the valve body without opening the refrigerant piping after pumpdown. For personal safety, shut off and lock out the unit power.

The coil can then be removed from the valve body by simply removing a nut or snap-ring located at the top of the coil. The coil can then be slipped off its mounting stud for replacement.

To replace the entire solenoid valve follow the steps involved when changing a filter-drier.

Evaporator

The evaporators on AGZ-E models 030 - 070 are brazed plate type. Other than cleaning and testing, no service work should be required on the evaporator.

Troubleshooting Chart

PROBLEM	POSSIBLE CAUSES	POSSIBLE CORRECTIVE STEPS
Compressor Will Not Run	1. Main switch. 2. Fuse blown. circuit breakers open 3. Thermal overloads tripped 4. Defective contactor or coil. 5. System shutdown by equipment protection devices 6. No cooling required 7. Liquid line solenoid will not open 8. Motor electrical trouble 9. Loose wiring	1. Close switch. 2. Check electrical circuits and motor windings for shorts or grounds. Investigate for possible overloading. Replace fuse or reset breakers after fault is corrected. Check for loose or corroded connections. 3. Overloads are auto-reset. Check unit closely when unit comes back on line. Allow time for auto-reset. 4. Repair or replace 5. Determine type and cause of shutdown and correct it before resetting equipment protection switch. 6. None. Wait until unit calls for cooling. 7. Repair or replace solenoid coil. Check wiring. 8. Check motor for opens, shorts, or burnout. 9. Check all wire junctions. Tighten all terminal screws.
Compressor Noisy Or Vibrating	1. Low or no refrigerant charge 2. Compressor running in reverse 3. Improper piping support on suction or discharge 4. Worn compressor isolator bushing 5. Worn Compressor	1. Repair and recharge 2. Check unit and compressor for correct phasing 3. Relocate, add, or remove hangers 4. Replace 5. Replace
High Discharge Pressure	1. Noncondensables in system 2. System overcharged with refrigerant 3. Optional discharge shutoff valve partially closed 4. FanTrol wiring not correct 5. Fan not running 6. Dirty condenser coil 7. Air recirculation	1. Extract the noncondensables with approved procedures. 2. Remove excess, check liquid subcooling. 3. Open valve. 4. Check FanTrol wiring. 5. Check electrical circuit, Check fan motor. 6. Clean coil. 7. Correct.
Low Discharge Pressure	1. Refrigerant flood back 2. Wind blowing into coil at low ambient 3. Faulty condenser temperature regulation 4. Insufficient refrigerant in system 5. Low suction pressure 6. Only one compressor operating	1. Correct. 2. Shield coil from direct wind, Wind guards are available. 3. Check condenser control operation. 4. Check for leaks. Repair and add charge. 5. See corrective steps for Low Suction Pressure. 6. See corrective steps for Compressor Will Not Stage Up.
High Suction Pressure	1. Excessive water temperature 2. Excessive load 3. Expansion valve overfeeding 4. Compressors running in reverse	1. Check control settings. 2. Reduce load or add additional equipment. 3. Check remote bulb. Regulate superheat. 4. Check for proper phasing.
Low Suction Pressure	1. Rapid load swings 2. Lack of refrigerant 3. Clogged liquid line filter drier 4. Expansion valve malfunctioning 5. Condensing temperature too low 6. Compressor will not unload 7. Insufficient water flow 8. Evaporator head ring gasket slippage 9. Evaporator dirty 10. Rapid load swings	1. Stabilize load. 2. Check for leaks, repair, add charge. Check liquid sight glass. 3. Check pressure drop across filter drier. Replace. 4. Check and reset for proper superheat. 5. Check means for regulating condenser temperature. 6. See corrective steps for Compressor Staging Intervals Too Low. 7. Adjust flow. 8. Take pressure drop across vessel and contact factory to obtain design pressure drop for that vessel. 9. Clean chemically. 10. Stabilize load.
Compressor Will Not Stage Up	1. Defective capacity control 2. Faulty thermostat stage or broken wire 3. Stages not set for application	1. Replace. 2. Replace. 3. Reset thermostat setting for application.
Compressor Staging Intervals Too Short	1. Thermostat control band not set properly 2. Faulty water temperature sensor 3. Insufficient water flow 4. Rapid load swings	1. Set control band wider. 2. Replace. 3. Adjust flow. 4. Stabilize load.

PROBLEM	POSSIBLE CAUSES	POSSIBLE CORRECTIVE STEPS
Compressor Oil Level Too High Or Too Low	1. Oil hang-up in piping 2. Low oil level 3. Loose fitting on oil line 4. Level too high 5. Insufficient water flow - Level too high 6. Excessive liquid in crankcase - Level too high 7. Short cycling	1. Review refrigerant piping and correct. 2. Check and add oil. 3. Check and tighten system. 4. Adjust thermal expansion valve. 5. Adjust flow. 6. Check crankcase heater. Reset expansion valve for higher superheat. Check liquid line solenoid valve operation. 7. Stabilize load or increase staging interval.
Compressor Loses Oil	1. Lack of refrigerant 2. Suction superheat too high 3. Crankcase heater burnout	1. Check for leaks and repair. Add refrigerant 2. Adjust superheat. 3, Replace crankcase heater.
Motor Overload Relays or Circuit Breakers Open	1. Low voltage during high load conditions 2. Defective or grounded wiring in motor 3. Loose power wiring or burnt contactors 4. High condenser temperature 5. Power line fault causing unbalanced voltage	1. Check supply voltage for excessive line drop. 2. Replace compressor motor. 3. Check all connections and tighten. 4. See corrective steps for High Discharge Pressure. 5. Check supply voltage. Notify power company. Do not start until fault is corrected..
Compressor Thermal Protection Switch Open	1. Operating beyond design conditions 2. Discharge valve partially shut 3. Blown compressor internal gasket 4. Voltage range or imbalance 5. High superheat 6. Compressor bearing failure	1. Add facilities so conditions are within allowable limits. 2. Open valve. 3. Replace gasket. 4. Check and correct. 5. Adjust to correct superheat. 6. Replace compressor .

Warranty Registration Form (Scroll)

Attention: Warranty Department
Daikin
P.O Box 2510
Staunton, VA 24402-2510

Scroll Compressor Equipment Warranty Registration Form
This form must be completely filled out and returned to the Staunton Warranty Department within **ten (10) days** of start-up in order to comply with the terms of "Daikin Limited Product Warranty".

Check, Test and Commissioning for
Scroll Product (AGZ, ACZ, WGZ, TGZ)

Note: Use OM and IMM or Later Manuals

Job Name: ______________________ **Startup Date:** ______________________

Daikin G.O. No.: ______________________ **Daikin S.O. No.:** ______________________

Installation Address: ______________________ **City/State/Zip:** ______________________

Purchasing Contractor: ______________________ **Phone:** ______________________

City/State/Zip: ______________________ **No. of units at site:** ______________________

Unit Model No.: ______________________ **Serial No.:** ______________________

Compressor # 1 Serial #: ______________________ **Compressor # 4 Serial No.:** ______________________

Compressor # 2 Serial. #: ______________________ **Compressor # 5 Serial No.:** ______________________

Compressor # 3 Serial #: ______________________ **Compressor # 6 Serial No.:** ______________________

Benshaw/DRC Control Box M/M #: ______________________ **Benshaw/DRC Control Box S/N #:** ______________________

I. PRE START-UP PROCEDURE

II. Pre Start-Up Checklist

Pre Start-Up Checklist, All NO checks require an explanation under "Description". Please check yes or no.

	YES	NO
A. Is the unit free of visible shipping damage, corrosion or paint problems?	☐	☐
B. Is unit installed level?	☐	☐
C. Does the unit meet all location, installation and service clearances per IM Bulletin?	☐	☐
D. Has thermostat bulb been properly installed in the well?	☐	☐
E. Are all set screws on all pulleys, bearings, and fans tight?	☐	☐
F. Does electrical service correspond to unit nameplate? Volts ________ Hertz ________ Phase________	☐	☐
G. Has electrical service been checked for proper phasing at each circuit power terminal block?	☐	☐
H. Has unit been properly grounded?	☐	☐
I. Has a fused disconnect and fuses or breaker been sized per product manual and installed per local code?	☐	☐
J. Are all electrical power connections tight?	☐	☐
K. Have compressor heaters and oil separator heaters been been operating for 24 hours prior to start-up?	☐	☐
L. Does all field wiring conform to unit electrical specifications?	☐	☐

M. Are all service and liquid line valves open? ☐ ☐

N. Have all shipping hold down plates been removed? ☐ ☐

O. Has a flow switch been installed per the IM bulletin? ☐ ☐

P. Has the chill water circuit been cleaned, flushed, and water treatment confirmed? ☐ ☐

Q. Does the chiller and condenser water piping conform to the IM Bulletin? ☐ ☐

R. Are fans properly aligned and turn freely? ☐ ☐

S. Is wind impingement against the air cooled condenser a consideration? ☐ ☐

T. Description of unit location with respect to building structures.

Description: ______________________________

____

____

III. REFRIGERATION SYSTEM

YES NO

A. Has all field piping been leak tested at 100 psig (690 kPA)? ☐ ☐

B. Has system been properly evacuated and charged? ☐ ☐

C. Refrigerant R-_____ Circuit 1 _____ lbs (kg) Circuit 2 _____ lbs. (kg) ☐ ☐

D. Does piping to unit appear to be adequately sized and installed according to the IM bulletin? ☐ ☐

E. Is a liquid line filter-drier installed in each circuit? ☐ ☐

F. Is level of oil in sightglass visible butnot more than 1/2 glass with compressors running? ☐ ☐

G. Is a liquid line solenoid installed in each circuit? ☐ ☐

H. Is expansion valve bulb properly installed and insulated? ☐ ☐

IV. DESIGN CONTROLS

A. CHILLER
Water Pressure Drop: ________ psig(kPa) ________ Ft. (kPa) ________ gpm (lps)
Water Temperatures: Entering ________ °F (°C) Leaving ________ °F (°C)

B. CONDENSER
Water Pressure Drop: ________ psig(kPa) ________ Ft. (kPa) ________ gpm (lps)
Water Temperatures: Entering ________ °F (°C) Leaving ________ °F (°C)

V. START-UP

YES NO

A. Does unit start and perform per sequence of operation as stated in the IM bulletin? ☐ ☐

B. Does condenser fans rotate in the proper directions? ☐ ☐

Warranty Registration Form (Scroll)

MICROTECH STATUS CHECK-Each Reading Must be Verified with Field Provided Instruments of Known Accuracy'

			MicroTech	Verification
C. Water Temperatures:	Leaving Evaporator	....	_____ °F (°C)	_____ °F (°C)
	Entering Evaporator	....	_____ °F (°C)	_____ °F (°C)
	Entering Condenser	....	_____ °F (°C)	_____ °F (°C)
	Leaving Condenser	....	_____ °F (°C)	_____ °F (°C)

D. Circuit #1 Refrigerant Pressures:

Evaporator _____ psig (kPa) _____ °F (°C) _____ psig

Minimum Condensor Pressure _____ psig (kPa)

Maximum Condenser Pressure _____ psig (kPa)

E. Circuit #2 Refrigerant Pressures:

Evaporator _____ psig (kPa) _____ °F (°C) _____ psig

Minimum Condensor Pressure _____ psig (kPa)

Maximum Condenser Pressure _____ psig (kPa)

F. Circuit #1 Refrigerant Temperatures:

	MicroTech	Verification
Saturated Evaporator Temperature	_____ °F (°C)	_____ °F (°C)
Suction Line Temperature	_____ °F (°C)	_____ °F (°C)
Suction Superheat	_____ °F (°C)	_____ °F (°C)
Saturated Condenser Temperature	_____ °F (°C)	_____ °F (°C)
Liquid Line Temperature	_____ °F (°C)	_____ °F (°C)
Subcooling	_____ °F (°C)	_____ °F (°C)

G. Circuit #2 Refrigerant Temperatures:

	MicroTech	Verification
Saturated Evaporator Temperature	_____ °F (°C)	_____ °F (°C)
Suction Line Temperature	_____ °F (°C)	_____ °F (°C)
Suction Superheat	_____ °F (°C)	_____ °F (°C)
Saturated Condenser Temperature	_____ °F (°C)	_____ °F (°C)
Liquid Line Temperature	_____ °F (°C)	_____ °F (°C)
Subcooling	_____ °F (°C)	_____ °F (°C)

H. Outdoor Air Temperature: .... _____ °F (°C) _____ °F (°C)

NON-MICROTECH READINGS

I. Does the system contain glycol? ☐ Yes ☐ No

Percentage by weight _____ or by ne_____

J. If the chilled water system include glycol, have the freezstats been adjusted lower tc t acutal quirements?

☐ Yes ☐ No

Note: See operation manual for low temperature on ice bank applications.

K. Waterside Pressure Drop:

Chiller: _____ psig (kPa) _____ Ft. (kPa) _____ gpm (lps)

Condenser: _____ psig (kPa) _____ Ft. (kPa) _____ gpm (lps)

L. Unit Voltage Across Each Phase: _____ V _____ V _____ V

M. Unit Current Per Phase: _____ amps _____ amps _____ amps

N. Compressor Current Per Phase:

Comrpessor #1:	_____ Amps	_____ Amps	_____ Amps
Compressor #2:	_____ Amps	_____ Amps	_____ Amps
Compressor #3:	_____ Amps	_____ Amps	_____ Amps
Compressor #4:	_____ Amps	_____ Amps	_____ Amps
Compressor #5:	_____ Amps	_____ Amps	_____ Amps
Compressor #6:	_____ Amps	_____ Amps	_____ Amps

VI. CONTROL CHECK AND SETPOINT VERIFICATION/STANDARD UNIT SETPOINT

MICROTECH SETPOINTS	MICROTECH	STANDARD
A. Leaving Evaporator	_____°F (°C)	_____°F (°C)
B. Reset Leaving	_____°F (°C)	_____°F (°C)
C. Reset Signa	_____ma	
D. Reset Optioi	_____	
E. Maximum Chilled Water Reset	_____°F (°C)	_____°F (°C)
F. Return Setpoint	_____°F (°C)	
G. Maximum Pulldown	_____°F (°C)	
H. Control Banc	_____°F (°C)	_____°F (°C)
I. Interstage Delay	_____sec.	_____sec.
J. Start-to-Stop Delay	_____min.	
K. Stop-to-Stop Delay	_____min.	
L. Stage Up Error	_____psig (kPa)	
M. Stage Down Error	_____psig (kPa)	

ALARM SETPOINTS MUST BE VERIFIED WITH INSTRUMENTS OF KNOWN ACCURACY

N. Low Pressure Hold	_____psig (kPa)	_____psig (kPa)
O. Low Pressure Unload	_____psig (kPa)	_____psig (kPa)
P. Chilled Water Freezestat	_____psig (kPa)	_____psig (kPa)
Q. High Pressure Cut-Out	_____psig (kPa)	_____psig (kPa)

R. Unit Type = ________

S. Number of Compressors = ________

T. Number of Stages = ________

U. Number of Fan Stages = ________

V. Software Version = ____________________

VII. FOR HEAT RECOVERY CHILLERS ONLY (Must Be Taken At Full Load)

A. Place Unit in heat recovery mode.

B. Waterside Pressure Drop: ________psig (kPa) ________Ft. (kPa) ________gpm (lps)

C. Waterside Temperatures: ______Inlet ______Outlet

D. Head Pressure: Circuit #1________psig (kPa) Circuit #2: ________psig (kPa)

E. Suction Pressure: Circuit #1________psig (kPa) Circuit #2: ________psig (kPa)

F. Compressor Current Per Phase

Compressor #1	________AMPS	________AMPS	________AMPS
Compressor #2	________AMPS	________AMPS	________AMPS
Compressor #3	________AMPS	________AMPS	________AMPS
Compressor #4	________AMPS	________AMPS	________AMPS

VIII. GENERAL

A. Are all control lines secure to prevent excess vibration and wear? ☐ ☐

B. Are all gauges shut off, valve caps, and packings tight after startup? ☐ ☐

Performed By: ______________________ Title: ______________________

Company Name: ______________________

Address: ______________________

City/State/Zip Code: ______________________ Telephone: ______________________

Modem Number: ______________________

Signature: ______________________ Date: ______________________

Contractor's Signature ______________________

Daikin Applied Training and Development

Now that you have made an investment in modern, efficient Daikin Applied equipment, its care should be a high priority. For training information on all Daikin Applied HVAC products, please visit us at www.DaikinApplied.com and click on Training, or call 540-248-9646 to speak to the Training Department.

Warranty

All Daikin Applied equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Applied representative for warranty details. To find your local Daikin Applied representative, go to www.DaikinApplied.com.

Aftermarket Services

To find your local parts office, visit www.DaikinApplied.com or call 800-37PARTS (800-377-2787).
To find your local service office, visit www.DaikinApplied.com or call 800-432-1342.

This document contains the most current product information as of this printing. For the most up-to-date product information, please go to www.DaikinApplied.com.

DAIKIN